



ENDANGERED, THREATENED, AND RARE FAUNA OF NORTH CAROLINA

PART III. A Re-evaluation of the Birds

Edited by DAVID S. LEE and JAMES F. PARRELL

Occasional Papers of the
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1990-1



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ELOISE F. POTTER
Editor

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Part III. A Re-evaluation of the Birds

Edited by

DAVID S. LEE

North Carolina State Museum of Natural Sciences

JAMES F. PARNELL

Department of Biological Sciences

University of North Carolina at Wilmington

in cooperation with other members
of the North Carolina Bird Records Committee

ALLEN BOYNTON

PHILIP J. CRUTCHFIELD

TOM HOWARD

E. WAYNE IRVIN

HARRY E. LeGRAND JR.

ELOISE F. POTTER

JEFFREY R. WALTERS

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Piping Plover on nest (J. F. Parnell)

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Bald Eagle (A. Carey/VIREO)

Endangered, Threatened, and Rare Fauna of North Carolina

Part III. A Re-evaluation of the Birds

A decade after the 1977 publication of *Endangered and Threatened Plants and Animals of North Carolina* (Cooper et al. 1977), the North Carolina State Museum began to update and upgrade the list of birds (Parnell and Committee 1977) that are of concern in North Carolina. Owing primarily to the accumulation of new information, we now recommend that more than 50 species listed in 1977 be placed in categories of lesser concern or not be included on the present list. We have also omitted 13 species whose status was undetermined in 1977. Two additional species, plus a third species whose status was undetermined in 1977, have been placed on the 1989 list, and one species has been moved to a category of greater concern. We recommend that 21 species be considered endangered, threatened, or of special concern. The status of five species, including two new ones, is undetermined. Finally, we provide a list of additional species that we consider to be either vulnerable to ecological problems or rare as breeding birds in North Carolina.

This present report is the third in a series of papers re-evaluating the endangered and rare fauna of the state. See Clark (1987) for additional information concerning these reports, current legislation, and related topics. Other committees already have addressed the current conservation status of mammals (Clark 1987) and marine and estuarine fishes (Ross et al. 1988). Reports on freshwater fishes, reptiles and amphibians, marine and estuarine mollusks, freshwater mollusks, and selected invertebrates of North Carolina are in preparation.

STATUS DEFINITIONS

Definitions of categories have been changed during the re-evaluation process. That was done largely to prevent confusion caused by application of the same terms to federally and locally endangered species. These changes are in general in accord with those proposed by the other North Carolina committees and with those proposed by the nongame program of the N.C. Wildlife Resources Commission. The categories are now as follows:

Endangered—Those taxa federally recognized as being in danger of extinction throughout their entire range (five species of birds).

Threatened—Those species federally recognized as being threatened with extinction throughout their range (one species).

Special Concern—Species whose breeding populations are in danger of extirpation in North Carolina and which may, or may not, be of concern over portions of their range outside North Carolina (15 species). Of lesser concern and discussed briefly are species considered *Vulnerable*. These

are not of immediate concern, but they appear to be subject to having problems in the future. Four birds remain *Undetermined* in status because we know little about their regularity of occurrence in North Carolina as breeding species. These birds could become regarded as Rare, Vulnerable, or of Special Concern if it is determined that they are nesting regularly in the state. Locally *Rare* species, mostly peripheral populations, are addressed briefly.

EXTINCT AND EXIRPATED SPECIES

There is good documentation that several birds now extinct once occurred in North Carolina, and other birds are known to have been extirpated from this state, at least as breeding species. According to Colonel William Byrd, the "Carolina Paroquet" (*Conuropsis carolinensis*) was common when he surveyed the North Carolina-Virginia boundary line in 1728. There are many literature references documenting the presence of "parrots" in the state from 1588 to 1731, but there is little to validate their presence after 1770 (William Bartram, Bladen County). McKinley (1979) provides a historical review of this parakeet for North Carolina. The species is known to have survived in South Carolina and Tennessee well into the second half of the 19th century. Passenger Pigeons (*Ectopistes migratorius*) once migrated through the mountains and piedmont of North Carolina in large numbers. They were apparently still common through the early 1870s, but their decline was rapid, and the last documented record for the state occurred in 1894.

Alexander Wilson collected a specimen of the rare Ivory-billed Woodpecker (*Campephilus principalis*) 12 miles north of Wilmington about 1800 (Wilson 1811). Although Audubon reported this bird from as far north as Maryland, the Wilmington locality probably represents the northern limit of its historic range (Tanner 1942). There are no other records for North Carolina, although the species was known to occur in the Santee River swamp of South Carolina, 70 miles from the North Carolina line, well into the 20th century (Tanner 1942).

No authentic records for either the Great Auk (*Pinguinus impennis*) or the Eskimo Curlew (*Numenius borealis*) exist for North Carolina. Evidence indicates, however, that the Great Auk regularly wintered as far south as Florida, and numerous fossil auk bones have been found at the Lee Creek Mine, Beaufort County (NCSM specimens). The Eskimo Curlew was apparently an offshore migrant that almost certainly flew regularly over North Carolina coastal waters. There is one unsubstantiated statement for this curlew's occurrence in the state during the 1800s (Simpson 1984), and one recent sight record lacks clear supporting evidence (Sonneborn 1975).

Bachman's Warbler (*Vermivora bachmanii*), a bird considered Endangered, was found in North Carolina on two occasions, both in 1891 at Raleigh (Pearson et al. 1959). It was reported from South Carolina as recently as 1976. Kirtland's Warbler (*Dendroica kirtlandii*), also an Endangered species, is an occasional migrant through the state (Craighill 1942, Pearson et al. 1959, Weisbecker 1987). Both of these migratory warblers are in serious trouble because of massive habitat changes in their wintering quarters in Cuba and the Bahamas, and because of certain deleterious factors operating on their nesting habitat in this country. An Endangered Species known from North Carolina's offshore waters is the Cahow (*Pterodroma cahow*) (Lee 1984). Despite their recognition as being Endangered, these two warblers and the Cahow are not included in the discussion that follows. The few state records are assumed to be of transients, and we have no evidence that any area of North Carolina is important to critical aspects of the life history of these birds.

Breeding populations of the Peregrine Falcon (*Falco peregrinus*) were extirpated from the eastern United States in the middle of the present century, with the last known active eyrie reported in North Carolina in 1957. During the past decade, an active restocking effort for Peregrines has been undertaken in the eastern United States, and work by the North Carolina Wildlife Resources Commission's nongame program is helping to re-establish this species in North Carolina.

RECENT STUDIES LEADING TO CHANGES IN CONSERVATION STATUS

As a result of our increased knowledge of the state's fauna, some birds on the 1977 list are not on the present one; others remain on the list but have been placed in categories of lesser concern. A considerable effort has gone into the study of the state's birds since the 1977 symposium, which helped field workers focus their attention on poorly understood species. Our increase in knowledge has come not only from planned studies, but also from an important series of observations made and reported by dedicated amateur bird watchers. Numerous random reports from throughout the state and from all times of the year have allowed us to see patterns in distribution, abundance, and season of occurrence. Compilation of these and other records by the authors of *Birds of the Carolinas* (Potter et al. 1980) and by Lee and Potter in an ongoing study of the distribution of the nesting birds of North Carolina (see maps with the accounts that follow) have considerably enhanced our understanding of many of the state's birds. In 1988 the State Museum initiated a statewide program to map the breeding distribution of all North Carolina birds. Approximately 200 cooperators are participating in this project.

Specific studies on selected birds, habitats, or geographic areas have provided major contributions to our increased knowledge during the last ten years. Studies at North Carolina State University on Red-cockaded Woodpeckers (*Picoides borealis*) and at the University of North Carolina at Wilmington on Brown Pelicans (*Pelecanus*

occidentalis) have been particularly useful in increasing our understanding of these species. Along similar lines, Lynch and LeGrand (1985), in a study on the breeding distribution of the Henslow's Sparrow (*Ammodramus henslowii*), dramatically changed our understanding of what was previously regarded as a rare species in North Carolina. Midwinter surveys of the Bald Eagle (*Haliaeetus leucocephalus*), sponsored by the Wildlife Resources Commission, have provided insight regarding the winter abundance and distribution of eagles.

Monitoring of hawk migrations on the Outer Banks of North Carolina—by personnel from the Carolina Raptor Center, a rehabilitation facility near Charlotte, and from the North Carolina State Museum—have determined patterns of movement, foraging habitat requirements, and relative abundance of Peregrines, Merlins (*Falco columbarius*), Northern Harriers (*Circus cyaneus*), Ospreys (*Pandion haliaetus*), and other species of current or previous concern. Parnell and others have extensively monitored colonial birds on coastal islands and have surveyed all known estuarine colonies (e.g. Parnell and Soots 1976, Parnell and McCrimmon 1983). These studies have documented population changes for several species under consideration and have helped develop management recommendations for colonial nesting birds. The North Carolina State Museum has extensively surveyed large areas of pocosin communities (Lee 1986) and Carolina Bays (Lee 1987) in the coastal plain of North Carolina. During these surveys, several species on the 1977 list were found to be quite common and widespread. In a study in the northwestern mountains of the state, museum personnel documented new or additional populations of species that, in 1977, were unknown as breeding species in the state or were believed to have a highly restricted nesting range (Lee et al. 1985, Lee 1985). Several short-term mountain surveys also provided additional useful information on species previously considered as rare (e.g. LeGrand and Potter 1980, Potter and LeGrand 1980, McConnell and McConnell 1983).

In an attempt to reintroduce two native breeding species, the North Carolina Wildlife Resources Commission has been releasing young Bald Eagles and Peregrine Falcons into appropriate portions of their original breeding range (see accounts of these two species in the following section). The Schiele Museum at Gastonia, working along similar lines, is releasing young Golden Eagles (*Aquila chrysaetos*) into the southern Appalachians. Because there is not good evidence that Golden Eagles historically nested in the mountains of North Carolina—or, for that matter, anywhere in the southern Appalachians—we have some misgivings about this well-intentioned project.

DISCUSSION

Table 1 compares the current conservation status of North Carolina birds with that proposed in 1977. We have listed five species of birds as Endangered: Wood Stork (*Mycteria americana*), Bald Eagle, Peregrine Falcon, Roseate Tern (*Sterna dougallii*), and Red-cockaded Woodpecker. These species are on the federal list and are considered Endangered throughout their range in North America. Abundance of these species varies within

North Carolina. For example, the Bald Eagle is now seen only occasionally away from the recently established summering group at Jordan Lake in the piedmont near Raleigh. Only a few natural nests have been discovered in the state during the last decade. On the other hand, the Red-eared Woodpecker, although present in greater numbers in North Carolina, is also considered to be Endangered throughout its range. Birds in this category represent cases where the factors leading to the endangerment are known and recovery programs have been developed.

The Piping Plover (*Charadrius melanotos*), a species listed as Federally Threatened along the Atlantic coast, reaches the southern limit of its breeding range in North Carolina (Golder 1985, 1986). It is the only Threatened bird that nests in North Carolina.

The Special Concern category includes those species whose present circumstances cause knowledgeable observers to be seriously concerned. Evidence of decline is often local and is, for the most part, not well documented. Special Concern forms generally fall into two subcategories. There are a number of birds that occur in all, or part, of North Carolina and are known to be declining throughout their range. Information on these species is relatively good on a long-term basis, and it generally shows a gradual decline. The other birds of special concern are peripheral, reaching their limit of distribution in our mountains or along our coast, and are usually confined to a rather specialized habitat. Several are represented in the state by endemic subspecies. Their problems result from particular habitat requirements and often are difficult to evaluate. Opinions differ, for example, regarding the degree that the high-mountain spruce-fir habitat is in danger and the extent to which habitat changes jeopardize the birds that, within our state, nest only there.

Throughout this report we generally are concerned only with breeding populations. However, several listed species have populations that winter within the state and move back to more northern nesting areas in the summer. So, for example, we are very much concerned about the Black-capped Chickadee (*Parus atricapillus*), which nests on only a few mountain peaks in North Carolina. To the north there is an abundance of Black-capped Chickadees, but they do not generally migrate into our state in large numbers. The Golden-crowned Kinglet (*Regulus satrapa*) nests on some of the same mountain peaks, and we are equally concerned about its nesting population. It is, however, a common winter resident throughout the state. The mountain group of locally restricted breeding species also includes the Northern Saw-whet Owl (*Aegolius acadicus*) and the Olive-sided Flycatcher (*Contopus borealis*). The Bewick's Wren (*Thryomanes bewickii*) probably no longer nests in the southern Appalachians.

Nineteen vulnerable species are briefly discussed. Our assessment of most of these birds has changed since the 1977 publication because of management, protection, or new information concerning their distribution and numbers in North Carolina. We do not feel that any of these are in jeopardy at the present time, but we recognize that they

need monitoring and that some species depend heavily on current land-management activities.

In 1977 seven species were considered rare, but their status of occurrence or distribution within North Carolina was unknown. These were included in a category called "Status Undetermined." Field studies during the last decade have enabled most of those to be omitted from the present list. For several species, however, data do not clearly indicate how regularly they occur in North Carolina during the nesting season or, in fact, whether they even nest here. Birds that remain in, or were added to, the Undetermined category include three species that are restricted to the mountains of North Carolina during the breeding season: Long-eared Owl (*Asio otus*), Northern Goshawk (*Accipiter gentilis*), and Pine Siskin (*Carduelis pinus*). The mountain birds are believed to be nesting in the state, but populations are most likely very local. Total breeding-season populations may be only one or two pairs. Other Undetermined species are the Yellow Rail (*Coturnicops noveboracensis*) and the American Avocet (*Recurvirostra americana*).

A number of species that were included in the 1977 list have been omitted because focused field effort has shown them to be more wide-ranging, more stable, or more abundant than previously believed. These are Turkey Vulture (*Cathartes aura*), Broad-winged Hawk (*Buteo platypterus*), Red-tailed Hawk (*Buteo jamaicensis*), Osprey, Merlin, Wild Turkey (*Meleagris gallopavo*), Common Moorhen (*Gallinula chloropus*), Laughing Gull (*Larus atricilla*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Willow Flycatcher (*Empidonax traillii*), Purple Martin (*Progne subis*), Common Raven (*Corvus corax*), Eastern Bluebird (*Sialia sialis*), Yellow Warbler (*Dendroica petechia*), Prothonotary Warbler (*Protonotaria citrea*), Black-and-white Warbler (*Mniotilla varia*), Worm-eating Warbler (*Helmitheros vermivorus*), Swainson's Warbler (*Limnothlypis swainsonii*), Vesper Sparrow (*Pooecetes gramineus*), Henslow's Sparrow (*Ammodramus henslowii*), Savannah ("Ipswich") Sparrow (*Passerculus sandwichensis ipswichii*), and Northern Oriole (*Icterus galbula*). Three species thought to have nested historically in the state were dropped from our list because we have found no convincing evidence to substantiate their former occurrence as locally nesting birds. These are Golden Eagle, American Swallow-tailed Kite (*Elanoides forficatus*), and Swainson's Thrush (*Catharus ustulatus*).

This is the pattern that emerges. Of the 395 species of birds known from North Carolina, 220 are known to nest within the state (Lee and Potter 1986). Of these, we are deeply concerned about the current status of only a few: five that are Federally Endangered, one that is Federally Threatened, and 15 that are of Special Concern. These are largely coastal birds, high-elevation birds confined to small islandlike communities on mountain tops, and birds requiring specialized successional stages of fire-influenced plant communities. The remaining birds have, or had, broad distribution in the state and are not confined to particularly narrow habitats.

All scientific and common names used in lists and accounts are from the 1983 AOU *Check-list of North American Birds*, Sixth Edition, with subspecific designations added where appropriate.

Table 1. Conservation Status of North Carolina birds in 1975 (from Parnell et al. 1977) and in 1989. All references to Vulnerable birds apply only to breeding populations. Except as species discussed in 1977, birds regarded as Rare or Undetermined in 1989 are not listed below.

Taxa	Status in 1977	Status in 1989
PELECANIFORMES		
Anhinga, <i>Anhinga anhinga</i>	Threatened	(not listed)
Brown Pelican, <i>Pelecanus occidentalis</i>	Endangered	Vulnerable
Double-crested Cormorant, <i>Phalacrocorax auritus</i>	Threatened	Vulnerable
CICONIIFORMES		
American Bittern, <i>Botaurus lentiginosus</i>	Undetermined	(not listed)
Least Bittern, <i>Ixobrychus exilis</i>	Threatened	(not listed)
Great Blue Heron, <i>Ardea herodias</i>	Special Concern	(not listed)
Great Egret, <i>Casmerodius albus</i>	Special Concern	Vulnerable
Snowy Egret, <i>Egretta thula</i>	Special Concern	Special Concern
Little Blue Heron, <i>Egretta caerulea</i>	Special Concern	Special Concern
Tricolored Heron, <i>Egretta tricolor</i>	Special Concern	Special Concern
Black-crowned Night-Heron, <i>Nycticorax nycticorax</i>	Special Concern	Vulnerable
Yellow-crowned Night-Heron, <i>Nycticorax violaceus</i>	Special Concern	(not listed)
White Ibis, <i>Eudocimus albus</i>	Special Concern	Vulnerable
Glossy Ibis, <i>Plegadis falcinellus</i>	Special Concern	Special Concern
Wood Stork, <i>Mycteria americana</i>	(not listed)	Endangered
ANSERIFORMES		
Black Duck, <i>Anas rubripes</i>	Special Concern	Vulnerable
FALCONIFORMES		
Black Vulture, <i>Coragyps atratus</i>	Threatened	Special Concern
Turkey Vulture, <i>Cathartes aura</i>	Threatened	(not listed)
Osprey, <i>Pandion haliaetus</i>	Special Concern	(not listed)
American Swallow-tailed Kite, <i>Elanoides forficatus</i>	Undetermined	(not listed)
Mississippi Kite, <i>Ictinia mississippiensis</i>	Undetermined	(not listed)
Bald Eagle, <i>Haliaeetus leucocephalus</i>	Endangered	Endangered
Northern Harrier, <i>Circus cyaneus</i>	Undetermined	(not listed)
Sharp-shinned Hawk, <i>Accipiter striatus</i>	Threatened	(not listed)
Cooper's Hawk, <i>Accipiter cooperii</i>	Threatened	Special Concern
Red-shouldered Hawk, <i>Buteo lineatus</i>	Threatened	Vulnerable
Broad-winged Hawk, <i>Buteo platypterus</i>	Undetermined	(not listed)
Red-tailed Hawk, <i>Buteo jamaicensis</i>	Special Concern	(not listed)
Golden Eagle, <i>Aquila chrysaetos</i>	Threatened	(not listed)
American Kestrel, <i>Falco sparverius</i>	Threatened	Vulnerable
Merlin, <i>Falco columbarius</i>	Threatened	(not listed)
Peregrine Falcon, <i>Falco peregrinus</i>	Endangered	Endangered
GALLIFORMES		
Wild Turkey, <i>Meleagris gallopavo</i>	Special Concern	(not listed)
GRUIFORMES		
Yellow Rail, <i>Coturnicops noveboracensis</i>	Undetermined	Undetermined
Black Rail, <i>Laterallus jamaicensis</i>	Undetermined	(not listed)
King Rail, <i>Rallus elegans</i>	Special Concern	(not listed)
Purple Gallinule, <i>Porphyrrula martinica</i>	Special Concern	(not listed)
Common Moorhen, <i>Gallinula chloropus</i>	Special Concern	(not listed)
CHARADRIIFORMES		
Wilson's Plover, <i>Charadrius wilsonia</i>	Special Concern	Vulnerable
Piping Plover, <i>Charadrius melanotos</i>	Special Concern	Threatened

Table I. Continued.

Taxa	Status in 1977	Status in 1989
CHARADRIIFORMES (continued)		
Laughing Gull, <i>Larus atricilla</i>	Special Concern	(not listed)
Gull-billed Tern, <i>Sterna nilotica</i>	Special Concern	Special Concern
Royal Tern, <i>Sterna maxima</i>	Special Concern	Vulnerable
Sandwich Tern, <i>Sterna sandvicensis</i>	Special Concern	Vulnerable
Roseate Tern, <i>Sterna dougallii</i>	(not listed)	Endangered
Common Tern, <i>Sterna hirundo</i>	Special Concern	Vulnerable
Forster's Tern, <i>Sterna forsteri</i>	(not listed)	Vulnerable
Least Tern, <i>Sterna antillarum</i>	Special Concern	Vulnerable
Black Skimmer, <i>Rynchops niger</i>	Special Concern	Special Concern
CUCULIFORMES		
Black-billed Cuckoo, <i>Coccyzus erythrophthalmus</i>	Special Concern	(not listed)
STRIGIFORMES		
Common Barn-Owl, <i>Tyto alba</i>	Special Concern	Vulnerable
Northern Saw-whet Owl, <i>Aegolius acadicus</i>	Threatened	Special Concern
PICIFORMES		
Red-headed Woodpecker, <i>Melanerpes erythrocephalus</i>	Special Concern	(not listed)
Yellow-bellied Sapsucker, <i>Sphyrapicus varius</i>	Undetermined	Vulnerable
Red-cockaded Woodpecker, <i>Picoides borealis</i>	Endangered	Endangered
PASSERIFORMES		
Olive-sided Flycatcher, <i>Contopus borealis</i>	Threatened	Special Concern
Alder Flycatcher, <i>Empidonax alnorum</i>	Undetermined	(not listed)
Willow Flycatcher, <i>Empidonax traillii</i>	Undetermined	(not listed)
Purple Martin, <i>Progne subis</i>	Special Concern	(not listed)
Common Raven, <i>Corvus corax</i>	Special Concern	(not listed)
Black-capped Chickadee, <i>Parus atricapillus</i>	Threatened	Special Concern
Red-breasted Nuthatch, <i>Sitta canadensis</i>	Special Concern	Vulnerable
Brown Creeper, <i>Certhia americana</i>	Threatened	Vulnerable
Bewick's Wren, <i>Thryomanes bewickii</i>	Threatened	Special Concern
Golden-crowned Kinglet, <i>Regulus satrapa</i>	Special Concern	Special Concern
Eastern Bluebird, <i>Sialia sialis</i>	Special Concern	(not listed)
Swainson's Thrush, <i>Catharus ustulatus</i>	Undetermined	(not listed)
Loggerhead Shrike, <i>Lanius ludovicianus</i>	Special Concern	Special Concern
Warbling Vireo, <i>Vireo gilvus</i>	Threatened	(not listed)
Yellow Warbler, <i>Dendroica petechia</i>	Special Concern	(not listed)
Black-throated Green Warbler, <i>Dendroica virens</i>	Special Concern	(not listed)
Cerulean Warbler, <i>Dendroica cerulea</i>	Threatened	Vulnerable
Black-and-white Warbler, <i>Mniotilla varia</i>	Undetermined	(not listed)
Prothonotary Warbler, <i>Protonotaria citrea</i>	Special Concern	(not listed)
Worm-eating Warbler, <i>Helminthorus vermivorus</i>	Undetermined	(not listed)
Swainson's Warbler, <i>Limnothlypis swainsonii</i>	Special Concern	(not listed)
Bachman's Sparrow, <i>Aimophila aestivalis</i>	Threatened	Special Concern
Vesper Sparrow, <i>Pooecetes gramineus</i>	Undetermined	(not listed)
Savannah "Ipswich" Sparrow, <i>Passerculus sandwichensis</i>	Special Concern	(not listed)
Henslow's Sparrow, <i>Ammodramus henslowii</i>	Special Concern	(not listed)
Northern Oriole, <i>Icterus galbula</i>	Undetermined	(not listed)
Red Crossbill, <i>Loxia curvirostra</i>	Undetermined	(not listed)
Pine Siskin, <i>Carduelis pinus</i>	Undetermined	Undetermined

Acknowledgments. The committee on North Carolina birds is essentially the same committee that evaluates new records of birds in North Carolina and is responsible for maintaining and upgrading the official state list of birds. Its members at the time this report was prepared consisted of Allen Boyton, N.C. Wildlife Resources Commission; Philip J. Crutchfield, Carolina Bird Club; Tom Howard, State Parks; E. Wayne Irvin, State Museum; Harry E. LeGrand Jr., Natural Heritage Program; David S. Lee, State Museum (chairman); James F. Parnell, University of North Carolina at Wilmington; Eloise F. Potter, State Museum; and Jeffrey R. Walters, N.C. State University. All committee members assisted in the preparation of this manuscript. Additionally, assistance with the preparation of the species accounts that follow was provided by J. H. Carter III, N.C. State University; Wm. Walker Golder, University of North Carolina at Wilmington; Thomas H. Henson, N.C. Wildlife Resources Commission; and Patricia P. Rabenald, Purdue University.

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DAVID S. LEE AND JAMES F. PARRELL

FEDERALLY ENDANGERED

WOOD STORK

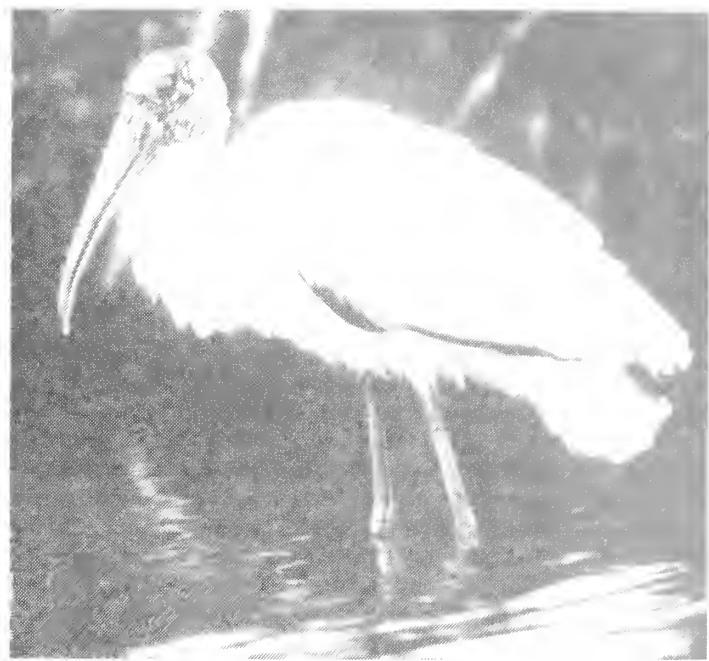
Mycteria americana Linnaeus

Range and Habitat. In the United States, the Wood Stork nests in southern South Carolina, eastern Georgia, and throughout much of the Florida peninsula. This stork also occurs also from Mexico to northern Argentina. In midsummer, after breeding is concluded, storks regularly wander northward to central South Carolina and southern North Carolina; the species winters from Florida southward (Kale 1978).

Small numbers of Wood Storks visit the Twin Lakes area in the vicinity of the Oyster Bay Golf Links at Sunset Beach in extreme southwestern Brunswick County each year from June to September. In recent years, as many as 25 to 30 nonbreeding birds have occurred regularly at these large freshwater ponds. Most of the storks are first-year birds. Despite the numbers at Twin Lakes, storks are not known to occur with regularity anywhere else in the state; away from this vicinity, only one or two sightings are reported each year, occasionally inland to the mountains. Wood Storks formerly (as late as the 1950s) occurred in numbers as postbreeding wanderers at Lennon's Marsh in Robeson County. However, the large breeding colony of wading birds abandoned that site in recent decades, and the storks have not returned. Storks apparently no longer occur with regularity in the state except at Sunset Beach.

Storks generally forage in freshwater or brackish ponds, lakes, and marshes. They prefer shallow water where small fish are concentrated. They may occasionally be seen in tidal marshes and on mud flats. Despite being seen mainly near the coast, the birds prefer freshwater feeding habitats. Storks roost (and nest) in trees, and portions of the day are often spent resting in trees.

Life History and Ecology. Wood Storks are colonial nesters, and often breed in heronries with other species of wading birds (herons, egrets, and ibises). There is a wide disparity in time between nesting in southern Florida and nesting in South Carolina. In southern Florida, nesting generally occurs in winter; but farther northward breeding usually occurs in spring or early summer. Nesting birds usually select stands of mature bald cypress (*Taxodium distichum*) or other wetland trees, and colonies are typically along a river or in a lake or pond. Several nests are often placed in the same tree. The average clutch is 2 to 5 eggs, with an average fledging rate of about two young per nest (USFWS 1984). Storks have a rather selective foraging behavior. They hold the bill partly open underwater, sweep it back and forth, and catch small fishes and other prey that come in contact with it. This manner of feeding requires prey to be very concentrated. In order to obtain sufficient food for nestlings, these birds need rather low water



Wood Stork (J. F. Parnell)

conditions, which concentrate fish. When water levels are too high, fish disperse and the tactile method of foraging becomes less efficient. Because of their reliance on relatively low water levels during the breeding season, stork colonies completely fail to rear young during some years.

Rationale for Evaluation. The Wood Stork is listed as Endangered in North Carolina because it is listed by the federal government as Endangered (Federal Register: 33885, 27 August 1984). In North Carolina this stork is only a visitor; however, it does occur regularly at one site.

Recommendations. Water levels of the ponds at Twin Lakes are a primary consideration for maintaining the summering population of storks in North Carolina. High to moderate water levels in the spring, followed by low to moderate levels in the summer and fall, would seem to provide for maximum stork numbers during their June to September stay in North Carolina. The ponds usually are low in late summer and show some mud flats. The lowering of water levels is primarily caused by high evapotranspiration rates and removal of water to irrigate the golf course. The presence of homes and the golf course surrounding the ponds does not seem to have discouraged the birds' use of the area. Because the stork is a Federally listed species, the significance of the birds at the resort area of Twin Lakes should be made known to Oyster Bay Golf Links employees, as well as to people who reside near the ponds. It is recommended that the present water management of the

ponds be continued and that the ponds not be used for disruptive recreational activities, as they are also inhabited by American Alligators (*Alligator mississippiensis*), nesting grebes and gallinules, and a host of other wildlife species.

It is not likely that major concentrations of storks occur elsewhere in the state. Aerial surveys of remote swamps and rivers in the southeastern corner of the state in July or August may, however, reveal the presence of additional storks.

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Prepared by HARRY E. LEGRAND JR.

BALD EAGLE

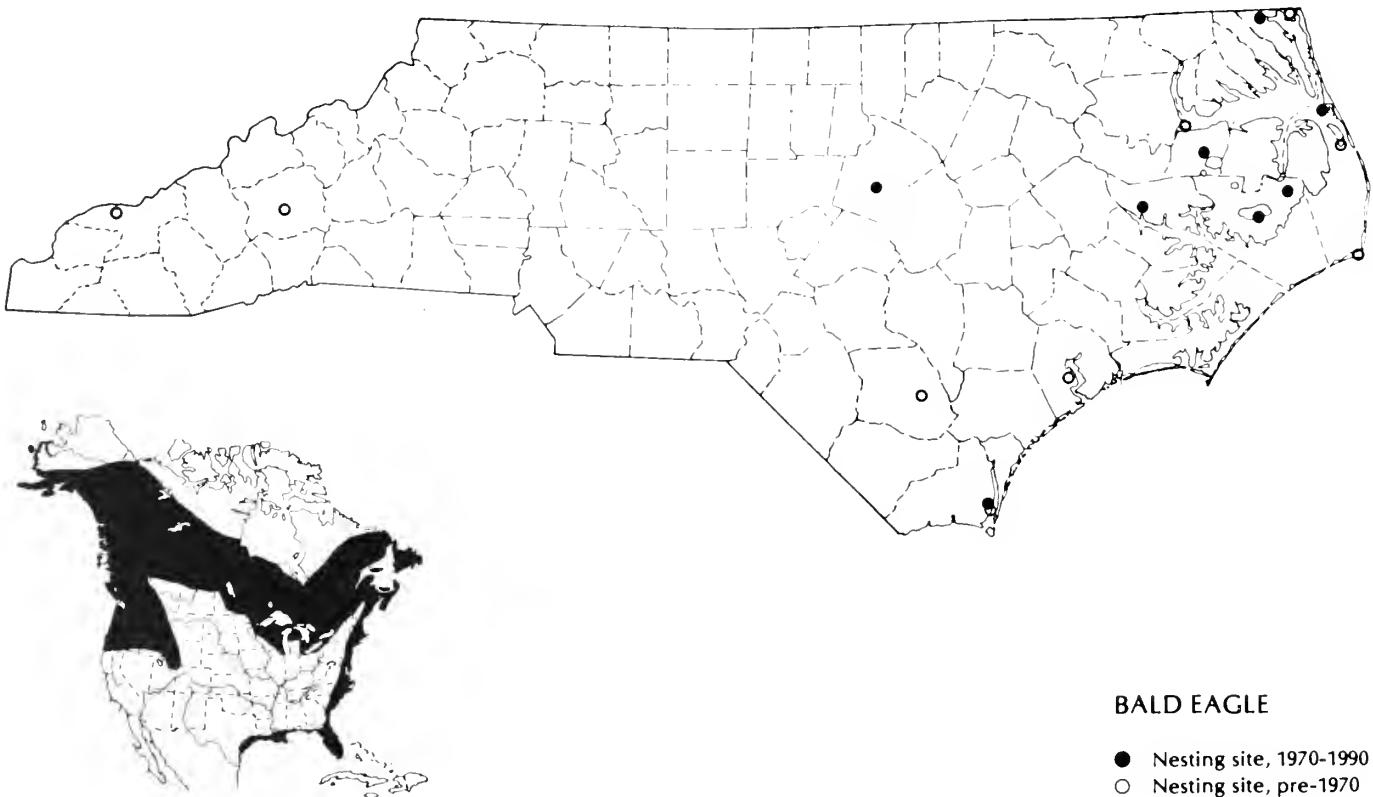
Haliaeetus leucocephalus (Linnaeus)

Range and Habitat. The Bald Eagle is widespread from northeastern Siberia, northern Alaska, Mackenzie, Manitoba, southeastern Quebec, and Newfoundland, south to Baja California, Arizona, New Mexico, and southern Texas. Historically, it was a common nesting species throughout

the coastal plain and along major lakes and rivers of the Southeast. In North Carolina, non-nesting Bald Eagles are most abundant in the northern portion of the coastal plain and in the Pee Dee-Yadkin River system. In recent years, eagles have established summer roosts at several piedmont reservoirs, the most notable of which is at Jordan Lake. Numbers using the Jordan site have been extremely variable, but it is not uncommon to count as many as 40 going to the roost on a late-summer evening. Much smaller numbers are present during other seasons.

In an attempt to help re-establish a breeding population of Bald Eagles in North Carolina, a hacking program was begun in 1983 by the N.C. Wildlife Resources Commission and other agencies. The stated objective of the program was to re-establish a self-sustaining population with 10 occupied breeding territories within the state. To date 33 eagles have been released into the wild at Mattamuskeet NWR in Hyde County. These eaglets were obtained from Chesapeake Bay, the Great Lakes States, Alaska, the Patuxent Wildlife Research Center Captive Breeding Program, and the Southeastern Bald Eagle Reestablishment Project. Band returns indicate that four of the 33 released birds have been found dead. Theoretically, the eagles from the earliest release years could now be nesting.

Life History and Ecology. Bald Eagles do not adapt well to changes in their environment and have a relatively low reproductive capacity. They are not reproductively mature until the age of four or five years. They mate for life but may not nest every year. In 1936, birds in the Chesapeake





Bald Eagle (C. Heidecker/VIREO)

Bay area produced an average of 2.1 young for every active nest but, by 1966, the average had fallen to 1.0. Since that time it has gradually increased to 1.7 (Abbott 1973). In North Carolina, the average for three known nests is 1.3.

In North Carolina, nest building or maintenance of old nests typically takes place in December and January. Laying of a 1- to 3-egg clutch is normally completed in early February, and hatching follows in mid-March after an incubation period of approximately 35 days. The young grow rapidly and by 8 weeks of age are as large as the parents. Both parents attend the young until fledging at 10 to 11 weeks of age.

Bald Eagles in the Southeast often nest in the ecotone between forest and marsh or between forest and water. Nests are typically constructed in dominant or codominant live pines or cypress and are usually less than 2 miles from open water (McEwan and Hirth 1979). The cone-shaped nest may be 6 feet or more in diameter and 6 to 8 feet from top to bottom. It consists of sticks lined with a combination

of leaves, grasses, or Spanish moss (*Tillandsia usneoides*). Winter habitat varies, but eagles are seldom far from water.

Bald Eagles are opportunistic feeders. The bulk of the diet is made up of fish, most of which are found dead or robbed from Ospreys (*Pandion haliaetus*). Eagles may also take various small mammals and birds, especially those weakened by injury or disease. McEwan (1977) found that fish made up 79% of the diet, with birds contributing 11%. Catfish and American Coots (*Fulica americana*) seem to be prevalent food items (McEwan 1977; Dugoni 1980; T. M. Murphy, unpublished data).

Rationale for Evaluation. The Bald Eagle has been protected under the Eagle Protection Act (16 U.S.C. 668-668d) of 8 June 1940, as amended 23 October 1972. It was listed as Endangered below the 40th parallel on 11 March 1967 and subsequently received protection under the Endangered Species Act of 1973 (16 U.S.C. 1531-1543). This listing includes the southern race, *H. l. leucocephalus*.

On 14 February 1978 the species' status was changed to Endangered throughout the lower 48 states except in Washington, Oregon, Minnesota, Wisconsin, and Michigan, where it was listed as Threatened.

Bald Eagle populations were on the decline until very recently and probably reached their low point in the 1970s. Since that time they have apparently been increasing (Cline 1983, Swenson 1983). This is especially true in North Carolina, as evidenced by the recent increase in nesting activity and the midwinter survey results. Bystrak (1974) indicated that no significant numbers occurred in the state in the early 1970s; since that time, counts have risen to at least 29 eagles during the midwinter surveys. Pearson et al. (1959) reported that only six nest sites remained in North Carolina by 1959. In 1977, Parnell et al. (1977) reported that, despite extensive aerial surveys, no nesting activity had been documented since 1971. In 1980 a single nest was found on the Outer Banks in Dare County; monitoring by the U.S. Fish and Wildlife Service showed that nest to be unsuccessful, and no subsequent attempts occurred at the site (O. Florshutz, personal communication). In 1984 an active nest was found in Hyde County, in 1985 an additional nest was located in Washington County, and a third was located in Beaufort County in 1988. Total known production of the three nests since they were discovered is 10. Numerous reports of nesting behavior by eagles indicates that additional nests will be established in the very near future.

The most dramatic declines in eagle populations nationwide were probably caused by environmental contaminants. Organochlorine compounds, especially DDT, inhibited calcium formation, resulting in thinning of the eggshell, which reduced reproductive success (Radcliffe 1967, Hickey and Anderson 1968, Krantz et al. 1970, Anderson and Hickey 1972). Mulhern et al. (1970) found widespread occurrence of DDT, DDE, and DDD in eagle carcasses. Cyclodiene dieldrin has also been documented at lethal levels (Mulhern et al. 1970). A literature summary of the effects of various chemicals on Bald Eagles can be found in Snow (1973). Since a ban on the use of DDT went into effect in the United States in 1972, a gradual recovery in Bald Eagle productivity has occurred. Most populations now seem to be producing chicks at the expected rate. Recently, new concern surfaced regarding the possibility that lead poisoning may be a significant factor in Bald Eagle mortality (Locke 1982).

The most significant factors limiting the rate of increase in eagle populations in North Carolina is probably habitat alteration and human encroachment. Compounding the situation is the fact that both people and eagles prefer waterfront locations. The cumulative effects of numerous development projects may ultimately determine the extent to which recovery of the species can occur. It should be mentioned, however, that a significant amount of new habitat has been created around man-made lakes. These areas now provide mostly roosting and wintering habitat, but they may become the site of nesting activity in the future.

Recommendations. The goal of the bald eagle recovery project in North Carolina as set by the Recovery Plan (Murphy et al. 1984) is 10 occupied nesting territories. As

previously discussed, three are known to exist and several other sightings indicate more may already be established. In order to determine further hacking needs, the N.C. Wildlife Resources Commission is conducting aerial surveys to assess the number of nests. Results of those surveys will dictate whether future hacking programs will be needed. Known nest sites and roosting habitat should be protected according to guidelines established by the U.S. Fish and Wildlife Service in conjunction with state agencies in the Southeast. This will involve limiting human activity in the vicinity of the nest and preventing disturbance of the habitat. The midwinter surveys should continue in order to monitor population trends and locate potential nesting pairs. All sightings of adult Bald Eagles between February and July should be reported to the N.C. Wildlife Resources Commission so that potential nest sites can be checked by aerial survey.

A common resident throughout much of North America in the eighteenth century, the Bald Eagle was viewed as a symbol of strength, courage, beauty, and freedom. Ironically, populations have plummeted over the past two centuries, so that today the Bald Eagle also symbolizes the effects of environmental contamination, habitat loss, human persecution of wildlife, and the impending free-fall of biological diversity throughout the world (Lewin 1986).

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Prepared by THOMAS H. HENSON

PEREGRINE FALCON

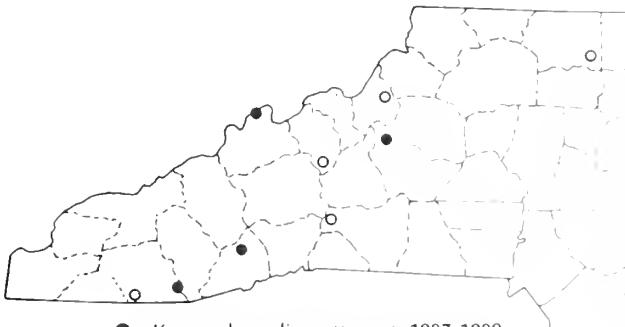
Falco peregrinus Tunstal

Range and Habitat. Once the Peregrine Falcon was nearly cosmopolitan. The race *F. p. anatum* bred in scattered areas throughout most of North America. In the East, it occurred north to northeastern Quebec, west to the upper Mississippi River Valley, south to northern Georgia, and west to northern Louisiana. Peregrine Falcons winter from the northern United States south to the Gulf of Mexico and much of Central and South America. Populations in the eastern United States may have been nonmigratory. Information is not yet available concerning the migratory behavior of Peregrines released in the southern Appalachians.

Modest numbers, probably from Arctic populations, winter in North Carolina, chiefly in coastal areas. Migrant individuals can be expected anywhere, but major movements seem confined to barrier beaches in late September and early October. These migrants are for the most part birds that breed in Greenland (Mattox and Seegar 1988), although individuals from across the northern edge of the continent and from the re-established eastern population have been captured on the Carolina and Virginia coasts (M. Byrd, personal communication). Peregrine Falcons were probably never abundant in the southern Appalachians because few suitable nest sites were available.

Life History and Ecology. Breeding populations of the Peregrine Falcon probably were extirpated in the eastern United States by 1964. Berger (Berger et al. 1969) drove more than 13,000 miles in 1964 checking 133 known nesting sites in this area, but failed to find a single active nest. In the past, eyries had been reported on cliffs along ridges, gorges, and bluffs from scattered localities in the North Carolina mountains (Spofford 1942). Four of the ten known nest sites in North Carolina were inactive by 1940, and the last active nest was reported in 1957 (Hickey 1969).

Peregrines normally do not breed until their second or third year. In established populations, competition apparently excludes some birds from nest sites (Ratcliffe 1980). In the absence of established populations, 1-year-old Peregrines released in New England have bred successfully (Gilroy, personal communication). Like most high-order predators, falcons normally produce small numbers of young, with a mean number of 3.7 eggs for the continental United States (Snow 1972). The average surviving number of young per pair per year ranges from 1.0 to 1.5 (Newton 1979); the average number of fledged young per successful pair per year ranges from 2.4 to 3.0 (Ratcliffe 1980). Not all pairs of Peregrines attempt nesting each year; currently about 75% of the pairs re-established in the eastern United States attempt breeding each year (Gilroy 1987). Nesting success of Peregrines varies greatly from year to year (Newton 1979). In addition, a high percentage of raptors die during their first year before acquiring hunting skills (Newton 1979). Data for Peregrine Falcons suggest at least 50% mortality among young, and some investigators believe 90% perish. Enderson (1969) used band recovery data to estimate that first-year mortality of Peregrines in North America was 70%. Band recovery data for northern populations indicate





Peregrine Falcon (J. F. Parnell)

20-50% annual adult mortality, but band loss may bias the figures by as much as 10% (Clement 1974). Nelson (1988) found an average loss of 32% of breeding adult Peregrine Falcons (*F. p. peali*) during a 12-year period in British Columbia.

Rationale for Evaluation. The Peregrine Falcon is listed as Endangered by the federal government (Federal Register: 10526; 20 March 1984) and is protected by treaties with Mexico, Canada, and Russia.

Populations suffered from collecting of young and subadults by falconers, and from shooting and egg collecting over a 70-year period (Hickey 1942). Peregrines appear to have withstood those assaults, only to have suffered a major decline because of the effects of toxic agricultural chemicals (Kiff 1988). Organochlorine chemicals caused abnormal behavior or lowered productivity in raptors without causing direct mortality. These effects were shown for heptachlor epoxide, endrin, DDE, and PCBs (Risebrough and Peakall 1988). Build-up of DDE, a metabolite of DDT, in reproductive tissues greatly lowered breeding success of Peregrines (Buckley et al. 1969). Dieldrin and aldrin caused mortality of Peregrine Falcons (Nisbet 1988), and such an incident was reported from the Pea Island National Wildlife Refuge (Reichel et al. 1974). The distinctive eastern population was probably in trouble well before the mid-1940s, and even minor deleterious effects of chlorinated hydrocarbon pesticides accelerated the mortality rate (Hickey 1969).

Although the use of DDT in the United States has decreased, Peregrine Falcons and their prey are still exposed to the pesticide while wintering in Central and South America

(Henny 1982). DDE is present in about 25% of infertile or addled eggs produced by Peregrine Falcons in the Atlantic coastal region of the northeastern United States (Gilroy and Barclay 1988). DDT is still applied legally in the United States because it is a contaminant of the miticide dicofol, used on cotton, citrus, fruit trees, and Christmas trees. The Environmental Protection Agency (EPA) has taken steps to reduce the amount of DDT residue in dicofol (Federal Register: 19508, 29 May 1986). Dicofol is not currently a restricted-use pesticide in North Carolina (K. Glenn, personal communication).

Other threats to the Peregrine Falcon exist in the East. The use of Peregrine nesting cliffs for climbing and other recreational purposes by humans has increased since the demise of the species as a breeder in North Carolina. Repeated disturbance during incubation can cause nest failure (Gilroy 1987). Accidents, such as collisions with vehicles, glass buildings, or power lines, also claim Peregrines, and they suffer from myiasis and botulism as well (White 1963).

Shooting, a major mortality factor prior to 1940, has probably declined in importance (Henny 1972). Migrant Peregrine Falcons were taken on the Outer Banks by falconers as recently as 1975. Recent advances in techniques of breeding captive Peregrines, and the subsequent availability of domestic Peregrines to falconers (Weaver 1988), have reduced the illegal take of wild Peregrines. The U.S. Fish and Wildlife Service (USFWS) failed to find a significant illegal take of Peregrines in the United States during Operation Falcon (Shor 1988).

Remarks. By the early 1970s, researchers had noted an 80% decrease in the number of migrant Peregrines along the Atlantic coast (Clement 1974). The same writer reported that the Greenland population, which migrated along the North Carolina coast, seemed to be in good shape, but there were no baseline data for comparison. Since 1975, however, the Greenland population of Peregrine Falcons has certainly increased (Mattox and Seegar 1988).

Releases of captive-reared, juvenile Peregrines have occurred in the United States since 1975. Several facilities bred captive Peregrines and produced young for the releases. The captive flock maintained by the Peregrine Fund, Inc. (PFUND) consisted primarily of *F. p. anatum* and *F. p. peali*, but other races were represented (Gilroy, personal communication). A few birds came from eyries in the eastern United States and Canada. By 1987, 2,000 Peregrine Falcons had been released, and 130 nesting pairs had been established in 20 states (Kiff 1988).

The PFUND, working with state wildlife agencies, the U.S. Forest Service (USFS), and the USFWS, has reintroduced a breeding population of Peregrine Falcons in the eastern United States (Grier and Barclay 1988). In 1986, 25 pairs of Peregrines produced 53 young; in 1987, 28 pairs produced 67 young. The re-established eastern population of Peregrine Falcons produced 1.88 young per nest attempt in 1985, 1.78 young per nest attempt in 1986, and 1.6 young per nest attempt in 1987 (Gilroy 1986, 1987). The recently documented decline of pesticides in songbirds (Johnson 1974) and other potential falcon prey, and in other species

of falcons (Clement 1974), augurs well for the re-established eastern population of the Peregrine.

The North Carolina Wildlife Resources Commission (NCWRC), the PEUND, and the USEWS initiated releases of juvenile Peregrine Falcons in North Carolina in 1984. Four birds were released in 1984, 10 in 1985, 13 in 1986, 18 in 1987, and 18 in 1988. Biologists have released Peregrine Falcons at Grandfather Mountain (Avery Co.), Yellow Mountain and Whiteside Mountain (Jackson Co.), Pickens Nose (Macon Co.), Sams Knob and Lennet Mountain (Haywood Co.), and Mount Mitchell (Yancey Co.). State wildlife agencies in Virginia, West Virginia, Tennessee, Georgia, and South Carolina have released young birds as well. Southeastern states released 105 young Peregrine Falcons between 1984 and 1987 (Gilroy 1987).

Releases of young Peregrine Falcons in North Carolina and other states will continue for several years to ensure the establishment of a Peregrine Falcon population in the southern Appalachian region. Biologists plan to conduct most future release work in Virginia and West Virginia.

We can take several other measures to return the Peregrine Falcon to North Carolina. An intensive survey effort to locate breeding pairs resulting from releases provides data with which to assess population growth. Close monitoring of nest sites allows protection of nests from human disturbance and the option of fostering young into nests, augmenting natural production. Monitoring of nests provides information on reproduction, food habits, pesticide loads, and reaction to human disturbance.

Some investigators suggest "short stopping" migrants by providing them with abundant, clean prey (Clement 1974). Barrier beaches with minimal human activity seem most attractive to transient Peregrines and probably to wintering birds as well. The maintenance of sizeable areas free of dense vegetation provides foraging habitat for migrant and wintering falcons. Annual monitoring of fall flights at coastal stations could provide needed data on the extent of migration of the re-established Peregrine population.

Hawks in general, and Peregrines in particular, have an aesthetic and dramatic appeal not equalled by most of our native birds. Every fall thousands of people flock to mountain ridges and other migration corridors to watch the spectacular flights of hawks. Peregrine Falcon populations in the eastern United States were just beginning to adapt to the urban environment prior to their decline. They would be a welcome addition to our biologically monotonous, ecologically unbalanced cities.

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Prepared by ALLEN BOYNTON AND DAVID LEE

ROSEATE TERN

Sterna dougallii dougallii Montagu

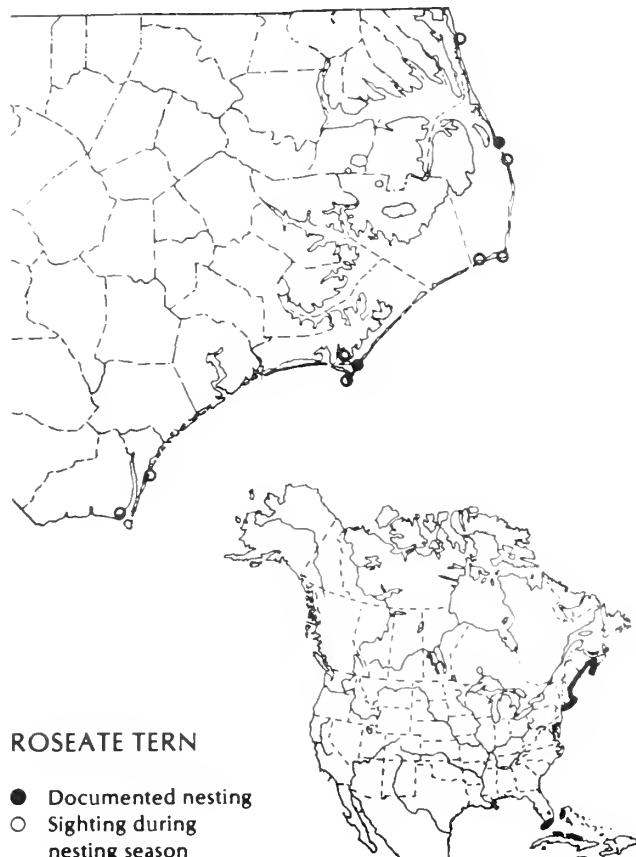
Range and Habitat. Roseate Terns are widely distributed throughout the Old World tropics with temperate nesting populations in South Africa, Great Britain, Europe, and remote oceanic islands. The nominate race occurs in the North Atlantic. In the western Atlantic it occurs from Nova Scotia south sporadically to North Carolina and from the Florida Keys south through much of the Greater and Lesser Antilles (AOU 1983, Harrison 1983).

Life History and Ecology. Western North Atlantic populations are migratory. Roseate Terns nest in dense grasses on the less disturbed coastal islands. They winter from the eastern Caribbean south to coastal Brazil. Migratory individuals are found primarily along the coast of North Carolina, but in the spring are also seen far at sea (Lee, personal observations). Roseate Terns in our area migrate northward in May and return south, passing North Carolina from August through October (latest date of occurrence, 28 October 1974). Additionally, there is one record of a bird picked up after a storm on 20 January 1937 at Cape Hatteras (Pearson et. al. 1959). Peak fall migration is in early September.

Although there is but one confirmed nesting record for the state (Soots and Parnell 1974), there are numerous North Carolina sight records of birds in breeding plumage in June, July, and August (birds in spring migration are also in full breeding plumage). Additionally, two specimens of very young birds (NCSM) collected in mid-August 1939 at Oregon Inlet are strongly suggestive of nesting 50 years ago. In North Carolina, Roseate Terns are typically associated with mixed tern colonies, and the number of summer records seems to be increasing. Despite intensive searching, no additional nest records are available for the state; but with increasing concern for the protection of tern colonies, it is likely that additional nesting will be documented in the near future. Because many Atlantic Coast terns are currently experiencing population expansion and range extension, it is possible that Roseate Tern colonies could develop in North Carolina in the next several decades.

Roseate Terns specialize in feeding on small, schooling marine fishes, which the birds capture by plunge-diving into the water. No specific prey species for these terns is known in North Carolina.

Rationale for Evaluation. The U.S. Fish and Wildlife Service determined that the northeastern population of Roseate Terns is Endangered and the Florida and Caribbean population is Threatened (Federal Register: 42064). Although birds from both western Atlantic populations probably occur in North Carolina, we assume most records represent birds of northern origin. The number of suitable nesting islands for this ground-nesting species has been greatly





Roseate Tern (A. Cruickshank/VIREO)

reduced by human activities. At the same time populations of large gulls (and perhaps other predators) have greatly expanded. Former Roseate Tern nesting areas such as Bermuda have been abandoned for decades. Recent surveys show that the populations of breeding birds in the northeastern United States, eastern Canada, and Europe have declined sharply (Buckley and Buckley 1984, Kirkham and Nettleship 1985, Cramp 1985). The nesting population in the northeastern United States is now estimated to be 2,500 to 3,300 pairs (Nisbet 1980, Buckley and Buckley 1981, Kress et al. 1983). The number nesting in Florida is extremely small. At least 29 major sites formerly used by Roseate Terns have been abandoned because of gull and mammal (house cat, *Felis domesticus*) predation (Nisbet 1980).

Recommendations. Active surveys of North Carolina tern colonies have been conducted on a regular basis for the last several decades with no indication of permanently established Roseate Tern colonies in the state. If colonies form, then protection from human disturbance and control of gulls, feral house cats, and other predators will be needed. At one site in southeastern Massachusetts, a gull removal program was implemented on an island where nesting gulls had displaced all terns by 1966. That island now supports nearly 60% of all nesting Roseate Terns in North America, as well as a large colony of Common Terns (*S. hirundo*). Proper management of successional stages of

beach grass may also be desirable if Roseate Tern colonies form.

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Prepared by DAVID S. LEE

RED-COCKADED WOODPECKER

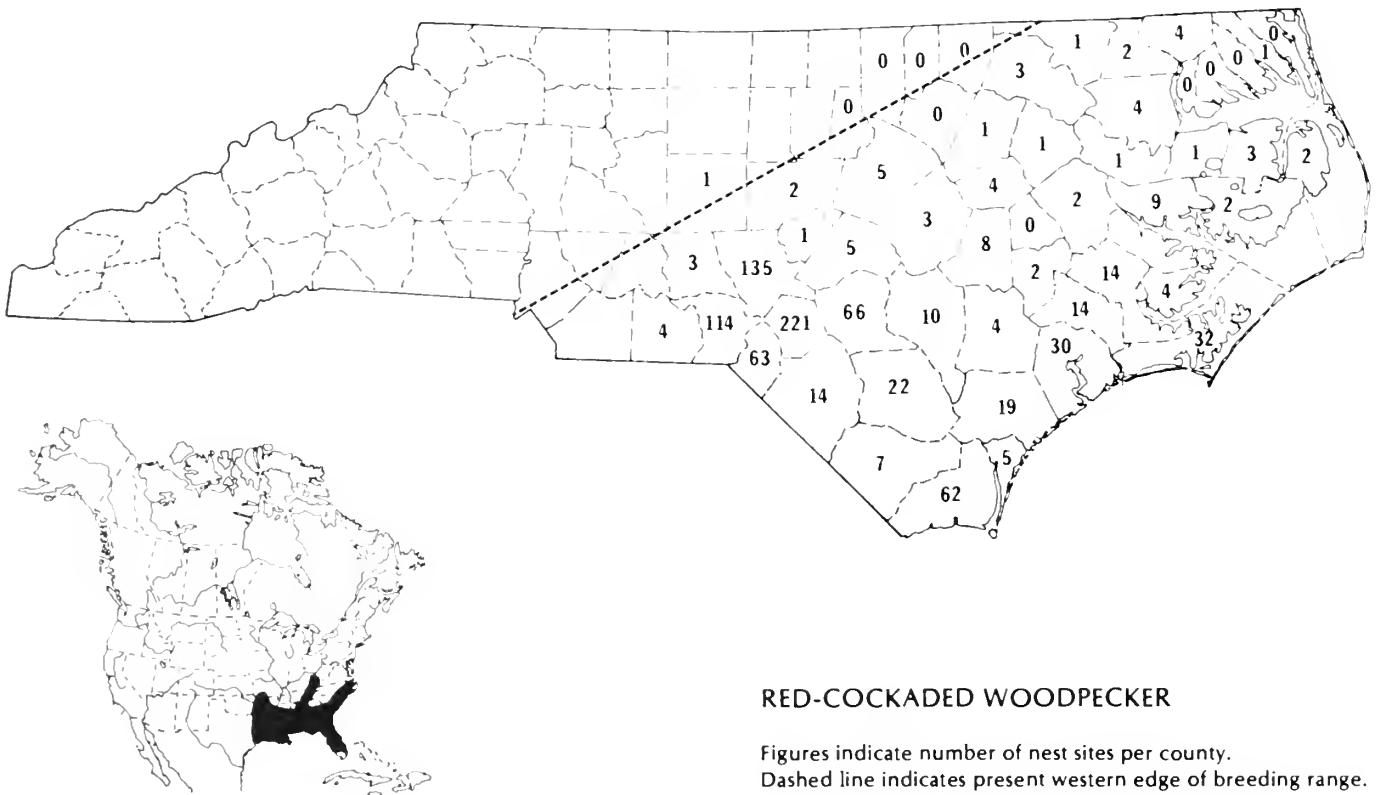
Picoides borealis borealis (Vieillot)

Range and Habitat. A resident species endemic to the southern United States, the Red-cockaded Woodpecker is undergoing a contraction of its range. Formerly it occurred from New Jersey to southern Florida and west to eastern Texas, and inland in Kentucky, Tennessee, Arkansas, Oklahoma, and Missouri (Audubon 1839; Jackson 1971, 1978). Currently, significant numbers exist only from North Carolina south along the Atlantic coast, along the Gulf Coast, and inland in southeastern Oklahoma and southern Arkansas (Jackson 1978, USFWS 1985). The distribution of colony sites in North Carolina, as reported in a 1978-1982 survey (Carter et al. 1983a), is indicated in the map below. A moderate population occurs in the Sandhills, and several small populations are found in the southern coastal plain.

Only scattered, relict populations remain in the northern coastal plain and piedmont.

The Red-cockaded Woodpecker is restricted to southern pine forests. The largest populations are found in longleaf pine (*Pinus palustris*), although loblolly pine (*P. taeda*), shortleaf pine (*P. echinata*), pond pine (*P. serotina*), slash pine (*P. elliottii*), and rarely Virginia pine (*P. virginiana*) and pitch pine (*P. rigida*) are also used (Jackson 1971, USFWS 1985). Open, parklike pine savannah with little hardwood understory or midstory is preferred (USFWS 1985, Ligon et al. 1986). A strong preference for living pines as foraging substrate has been demonstrated (Hooper and Lennartz 1981, Labisky and Porter 1984, USFWS 1985, Ligon et al. 1986), but their most striking habitat requirement is that of mature living pines for cavity excavation. Trees infected with red heart fungus (*Phellinus pini*) are often selected, presumably because excavation is easier if the heartwood is rotten, and these are usually the oldest trees in the forest. Longleaf cavity trees usually average around 100 years in age (USFWS 1985); but where even older trees exist in the North Carolina Sandhills, many cavity trees are more than 200 years old. Similar ages have been reported for shortleaf and pond pine, whereas cavity trees average about 20 years younger in the faster-growing slash and loblolly pines (USFWS 1985).

The species' dependence on specific habitats cannot be overemphasized, nor can its need for old trees. Red-cockaded Woodpeckers have consistently shown a preference for the oldest trees available in both foraging and cavity excavation; however, old-growth pine is so uncommon in the South today that it has not been possible to determine the ideal age of trees or habitat.



RED-COCKADED WOODPECKER

Figures indicate number of nest sites per county.

Dashed line indicates present western edge of breeding range.



Red-cockaded Woodpecker

(J. F. Parnell)

Life History and Ecology. The Red-cockaded Woodpecker is unusual among North American birds in being a cooperative breeder. Many males (and rarely females), instead of dispersing, remain on their natal territories as nonbreeding helpers for one to several years. The birds live in family groups consisting of a breeding pair and up to four male helpers. Usually each individual has its own roost cavity; thus, each group requires several cavity trees, which collectively are referred to as a colony. Only one brood is raised per year, and up to four young may be fledged.

Dispersing young may leave the natal colony soon after fledging, but they often leave much later, perhaps not until the following spring. Young travel with their natal family group until dispersing. Dispersing birds search for an existing group that lacks a breeder of their sex. As a result, colonization of new territories is almost unheard of, but existing groups (and colonies) can persist (with changing membership) for very long periods. This kind of stability is unusual among birds but typical of cooperative breeders that exhibit habitat saturation (Woolfenden and Fitzpatrick 1984, Ligon et al. 1986). Habitat saturation describes a situation in which selection favors competing for existing territories, either because they are the only ones or because they are the only high-quality ones, over forming new territories. In the case of the Red-cockaded Woodpecker, it may be the presence of completed cavities, which require

enormous expenditure of time and energy to construct, that makes existing territories greatly superior to unoccupied areas.

Research in the North Carolina Sandhills from 1979 to 1987 (Carter et al. 1983b, Walters et al. 1988) indicates a mortality rate of 23% per year for breeding and helper males and 29% per year for breeding females. This suggests that occasional individuals may live as long as 10 to 15 years. Mortality is much higher during the first year, 50% for males and 58% for females, owing in part, presumably, to the difficulty of dispersing successfully. Typical dispersal distances are about 2 miles for females and 3 miles for males, but dispersals of up to 20 miles for females and 13 miles for males have been recorded. Helper males do not disperse to wander in search of a territory. Instead, they inherit breeding status in their own territory or replace breeding males in neighboring territories when a vacancy arises.

Red-cockaded Woodpeckers forage as family groups, feeding on invertebrates—taken primarily by scaling bark on living pines—and sometimes on fruit and mast. There is a pronounced sexual dimorphism in foraging, females feeding on the trunk, males on the limbs and twigs (Ligon 1968). Groups range over large areas. Territories in the best remaining habitats average 50 to 70 ha (125-175 acres), and the birds may use up to several hundred additional hectares of extraterritorial home range (Hooper and Lennartz 1981, USFWS 1985, Repasky 1985). The area used increases as habitat quality declines. How critical the extraterritorial home range is to reproduction and survival is unknown.

Rationale for Evaluation. The Red-cockaded Woodpecker is Federally Endangered (Federal Register: 16047, 13 October 1970). Much of North Carolina was once covered with habitat suitable for this woodpecker. The original forests were cut around the turn of the century, and presumably the bird's population was greatly reduced and restricted to isolated pockets of habitat during that period (Parnell et al. 1977:346). Old-growth pine savannah has continued to decline since that time, owing to timbering practices that emphasize short rotations, thereby eliminating old trees on which the birds depend, and to fire suppression, which results in understory development and hardwood encroachment (Ligon et al. 1986). Only in the last 20 years have data been collected to document population trends. These data clearly indicate that the Red-cockaded Woodpecker continues to decline (USFWS 1985, Ligon et al. 1986). Throughout the range of the species, no population has increased in size during that period, only a few populations have remained relatively stable, many have declined, and several have become extirpated.

In the North Carolina Sandhills there apparently was a significant decline in the mid-to-late 1970s. Many colonies in this region are now abandoned, and J. H. Carter III observed the gradual abandonment of several colonies between 1974 and 1979. There was a further decline of 16% in the number of groups between 1981 and 1983, and this was followed by a period of stability (3% decline) through 1985 (Carter et al. 1983b, Walters et al. 1988, Table 2).

The four largest populations in North Carolina (Sandhills, Camp Lejeune, Croatan National Forest, Sunny

Point Military Ocean Terminal) contained approximately 535 groups and 1,300 adult birds in 1988. It is unlikely that there are more than 50 additional groups of woodpeckers (120 adults) elsewhere in the state.

Evidence indicates a small and declining Red-cockaded Woodpecker population statewide. The species' habitat requirements, its need for a large acreage per bird, and its unusual dispersal practices as a cooperative breeder combine to make it unusually vulnerable to habitat loss. On the other hand, helpers serve as a buffer between adult mortality and reproduction, so that the species is less vulnerable to population oscillations than many other bird species. There is the hope, then, that if proper habitat is preserved, the population using that habitat may be capable of prolonged survival.

The Sandhills region contains one of the four largest remaining populations of the Red-cockaded Woodpecker in the state, and North Carolina is one of only eight states with significant numbers of the species. Preservation of this bird in North Carolina is, therefore, critical to continued existence of the species. Protecting these birds has significant economic consequences because of their requirements for old-growth forests. Conservation of the species is not compatible with timber practices such as short rotation and massive clear-cutting, nor with many other land-use practices that require habitat alteration.

The Red-cockaded Woodpecker is the only member of its avian community that regularly excavates cavities in living pines. Secondary cavity-nesting species such as Eastern Bluebirds (*Sialia sialis*) and even other primary cavity-nesters such as Red-bellied Woodpeckers (*Melanerpes carolinus*) are likely dependent on Red-cockadeds as cavity producers. Generally, the bird is a useful indicator species for pine savannah, the ecosystem type to which it is adapted.

Current Protection. The species is listed by the federal government as Endangered throughout its range. A new recovery plan (USFWS 1985) was issued recently, and on the recommendation of the International Council for Bird Preservation, the American Ornithologists' Union appointed a committee of biologists to evaluate the status of the Red-cockaded Woodpecker. Their report (Ligon et al., 1986) is a strong statement of the urgent need to provide better protection for the species.

Recommendations. Within North Carolina, the primary need is for effective management. The species continues to decline in the southern coastal plain, and is nearly extirpated from the piedmont and northern coastal plain.

If suitable habitat is provided, the species can coexist with humans. Birds nest in residential neighborhoods in Southern Pines, Pinehurst, and Boiling Springs Lake. Management guidelines are outlined in the species' recovery plan (USFWS 1985), but these are minimum standards that likely are insufficient (Ligon et al. 1986). Protected areas must be very large, because 373 to 750 ha (150-300 acres) or more are required per group to ensure that populations are of sufficient size to persist. If logging is permitted, timber rotations must be long (100 years or more). There must be absolute protection of cavity trees and potential replacement cavity trees. Habitat should be burned regularly, at least every 3 years, to prevent understory encroachment. Stands

Table 2. Decline of the Red-cockaded Woodpecker population in a portion of the North Carolina Sandhills, 1980-1987 (Carter et al. 1983b, Walters et al. 1988).

Year	1980	'81	'82	'83	'84	'85	'86	'87
No. groups	350 ^a	234	203	197	192	186	187	191
No. adults		?	513	457	443	436	475	454
No. young fledged		?	294	204	204	286	205	282

^a Estimated from presence of 384 known colony sites in 1979 (these data do not include the entire Sandhills population).

may need to be thinned occasionally as well. Active management is a necessary aspect of conservation of the Red-cockaded Woodpecker.

Areas in and around Pinehurst and Southern Pines can serve as models for preserving the species on private land. Protecting old-growth trees during development has been a key factor there. However, effective management is most likely to occur on public lands. The 1978 survey indicated that 63% of existing colonies in North Carolina were located on public lands (Carter et al. 1983a). Of these, 53% were on military lands, 10% on national forests, 1% on other federal holdings, 31% on state-owned game lands, 2% on state parks, and 2% on other state holdings. The most critical areas are Fort Bragg, Camp LeJeune, Croatan National Forest, and the Sandhills Game Lands.

There is as yet no known means by which populations can be increased. The emphasis must be on halting habitat loss and vigorously managing existing habitat. One can only hope that consistent application of more stringent management guidelines may result in a population increase. Sufficient numbers of birds exist to make preservation realistic. It is important to act now, before populations fall to hopelessly low levels.

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Prepared by JEFFREY R. WALTERS

FEDERALLY THREATENED

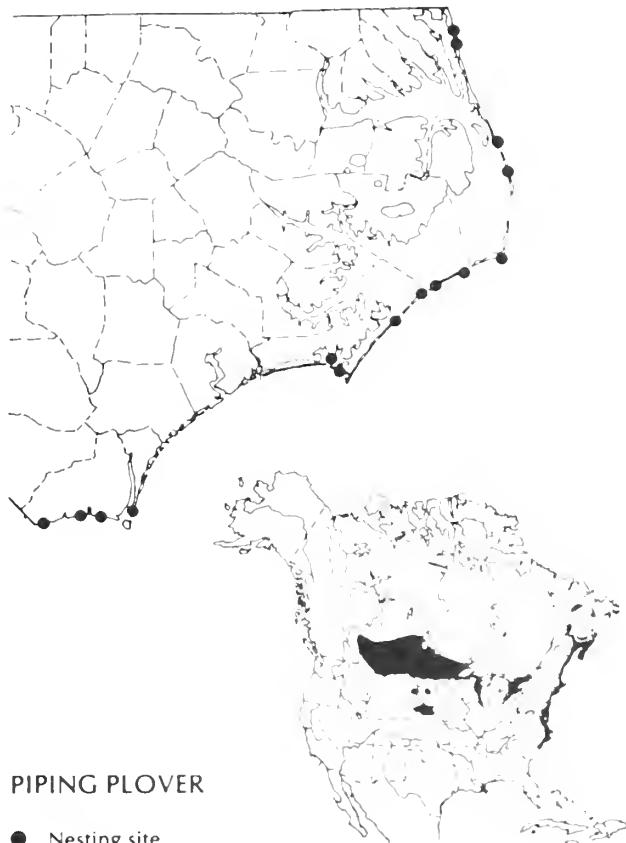
PIPING PLOVER

Charadrius melanotos melanotos (Ord)

Range and Habitat. This species breeds along the Atlantic Coast from Newfoundland to North Carolina, in the Great Lakes region, and on the northern Great Plains. Piping Plovers winter along the Atlantic Coast from North Carolina to the Florida Keys; in the Bahamas and West Indies; and along the Gulf of Mexico from southern Florida to southern Texas (Haig and Oring 1985).

In North Carolina, the Piping Plover is uncommon along the coast throughout the year. Nesting sites have been discovered along barrier beaches from the Virginia line to Shackleford Banks (Pearson et al. 1959; Hespenheide 1961; Quay et al. 1970; LeGrand 1977, 1983; Golder 1986) and at an isolated site on Sunset Beach (LeGrand 1984). Sunset Beach is the southernmost known breeding site for the species. During fall and winter months Piping Plovers can be found along sandy beaches and shoals throughout the coastal area.

Life History and Ecology. Piping Plovers begin arriving on nesting grounds in late March and April, usually returning to the site where they nested the previous season or where they were raised (Wilcox 1959, Cairns 1982). Nesting habitat includes sandy beaches, usually near inlets or on washover fans along the Atlantic Coast, or along the shore of inland lakes; bare areas on natural islands and dredged-material islands in rivers; gravel pits; and salt-encrusted bare sandy areas, pebbly mud, or gravel on interior alkaline lakes and



ponds (Sidle 1985). A typical nest is a shallow depression lined with small shell chips, pebbles, or other debris. The amount of nest lining and nesting material will vary depending on the nesting substrate (Cairns 1982). Four creamy, buff-colored eggs, which have a fine, evenly spaced peppering of black, brownish or purplish markings, compose a full clutch (Bent 1929). Eggs are laid every other day until the clutch is complete (Wilcox 1959). Both parents participate in incubation, which lasts approximately 28 days. Chicks leave the nest as soon as their down has dried, typically 2 to 3 hours after hatching, and remain in the general vicinity of the nest until fledging (Wilcox 1959). Fledging occurs 30 to 35 days after hatching. Departure from the nesting grounds is generally in August.

Rationale for Evaluation. The species is listed as Threatened by the U.S. Fish and Wildlife Service (Federal Register: 50733, 11 December 1985). Piping Plovers were once common on Atlantic Coast beaches. Shooting throughout the entire season, primarily for the millinery trade, however, drastically reduced numbers almost to the point of extirpation in some areas. The species recovered somewhat by the 1920s, following federal protection as a result of the Migratory Bird Treaty Act (Bent 1929). Populations peaked in the 1930s but have declined steadily since that time; the bird has vanished as a nesting species in some areas (Haig and Oring 1985). Piping Plovers have been "Blue Listed" by the National Audubon Society since 1972 (Arbib 1972).

In 1985, an estimated 722 nesting pairs were found along the Atlantic Coast of the United States and Canada; 476 of these were in the United States (Sidle 1985). Massachusetts, New York, and Virginia had a majority of the pairs. An estimated 17 nesting pairs were found in the Great Lakes, and 1,439 nesting pairs were in the northern Great Plains in 1985 (Sidle 1985). North Carolina had approximately 30 nesting pairs in 1985 (Sidle 1985), most of which were on Portsmouth and Hatteras Islands (Fussell, personal communication; Golder 1986).

The Piping Plover has been designated Endangered in the Great Lakes, Threatened throughout the rest of the United States, and Endangered in Canada (Sidle 1985). Two subspecies have been recognized: *Charadrius melanotos circumcinctus* (the northern Great Plains population) and *C. m. melanotos* (the Atlantic Coast population). The birds of the Great Lakes Region are intermediate and are referred to as *C. m. circumcinctus* (AOU 1957).

Recommendations. Piping Plovers in North Carolina depend on undisturbed sandy beaches for nesting and wintering. Development and recreational use of suitable beaches has eliminated much habitat. Protection of remaining nesting and wintering habitat is crucial to the survival of this species in North Carolina. Nesting sites should be located and given long-term protection. Active sites should be monitored annually and posted to provide maximum protection from human disturbance.

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Prepared by WALKER GOLDER AND JAMES F. PARNELL

SPECIAL CONCERN

SNOWY EGRET, *Egretta thula* (Molina)

LITTLE BLUE HERON, *Egretta caerulea* (Linnaeus)

TRICOLORED HERON, *Egretta tricolor* (Müller)

Range and Habitat. These three medium-sized herons breed along the Atlantic Coast of North America from New England to Florida (AOU 1983). In North Carolina they nest in colonies along the coast from Brunswick County to Dare County (Parnell and Soots 1979). All nesting colonies are presently in or very near coastal estuaries (Parnell and Shields, in press), although they have, in the past, nested in coastal swamp forests (Pearson et al. 1919). Colony sites are most commonly in dense low thickets on small islands in the coastal sounds or river mouths. Some colonies are located on barrier islands (Parnell and McCrimmon 1984).

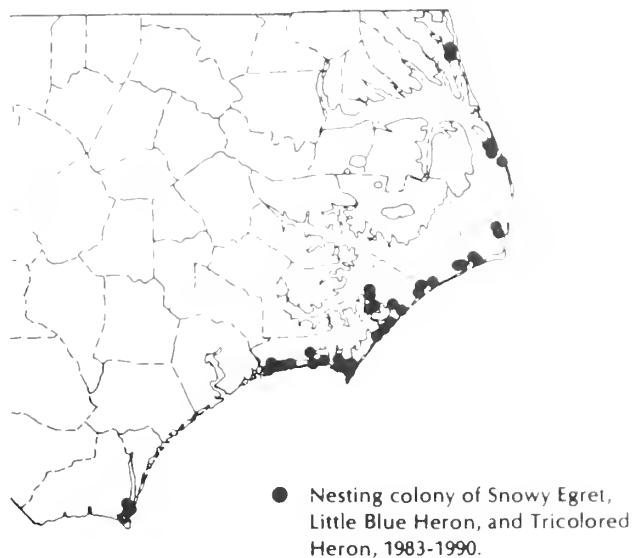
All three species were reported nesting in North Carolina in the late 1800s and early 1900s, but the Snowy Egret had become very rare, owing to the value of its feathers (Pearson et al. 1919). Tricolored Herons and Little Blue Herons were apparently relatively abundant and were not subject to the feather trade (Pearson et al. 1919).

Censuses conducted in 1977 showed that there were about 1,000 Snowy Egret nests, 1,500 Tricolored Heron nests, and 800 Little Blue Heron nests in the state (Parnell and Soots 1979). In 1983 there were about 700 Snowy Egret nests, 1,400 Tricolored Heron nests, and 1,200 Little Blue Heron nests (Parnell and McCrimmon 1984). In 1988, numbers of nests were much reduced, with only about 400 Snowy Egret, 600 Tricolored Heron, and 400 Little Blue Heron nests estimated to be present. There was also a reduction in the number of colonies occupied: from 16 to 18 in 1977 to only 7 or 8 in 1988 (Parnell and Shields, in press). The 1984 censuses were not directly comparable to the 1977 and 1983 data because of differences in weather between years, but the changes were so dramatic as to

indicate that there were real declines in numbers, and the reduction in the number of sites occupied appears very real.

Life History and Ecology. All three of these herons are primarily summer residents along the coastal zone of North Carolina, although some individuals remain all year. In late summer they wander inland during a period of dispersal from colony sites (Potter et al. 1980).

These three species are regular components of most of the mixed-species heronries from the Cape Fear River to Currituck Sound. They arrive at colony sites in April and build their stick nests in a variety of situations from the ground to several meters high in woody vegetation. The most typical placement in North Carolina is in shrub thickets of wax myrtle (*Myrica cerifera*), yaupon (*Ilex vomitoria*), and low tide bush (*Iva frutescens*). One to four eggs are laid, and incubation requires 21 to 25 days (Jenni 1969).



Snowy Egret



Little Blue Heron



Tricolored Heron



Chicks are hatched in a very altricial condition and require 3 to 4 weeks before leaving the nest (Palmer 1962). Colonies may thus be occupied into July or August (Parnell and Soots 1979).

Rationale for Evaluation. Surveys in 1988 indicate that nesting populations have declined since the last surveys in 1983 and that there is a decrease in the number of nesting colonies along our coast. There is also concern that coastal colonies are facing increased levels of disturbance from humans.

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Prepared by JAMES F. PARNEEL

GLOSSY IBIS

Plegadis falcinellus (Linnaeus)

Range and Habitat. In North America, the Glossy Ibis nests from southern Florida northward along the Atlantic Coast to Maine (AOU 1983). It is replaced along the Gulf Coast at about the Mississippi River by the very similar White-faced Ibis (*Plegadis chihi*). Glossy Ibises are found in North Carolina throughout the year, but numbers are much greater in summer than in winter (Potter et al. 1980). In addition, many transient birds pass along the coast during spring and fall migratory movements.

In North Carolina, Glossy Ibises feed primarily in shallow coastal wetlands, usually in estuaries but sometimes in freshwater systems. Birds arrive at breeding sites in April and nest among other species of wading birds in the coastal heronries. Nesting usually begins in mid-April. The bulky nests may be placed on the ground, in shrubs, or in low trees. Two to three eggs are usually laid, incubation requires 21 days, and the young fledge at about 6 weeks of age.



Snowy Egret
(J. F. Parnell)



Little Blue Heron



Tricolored Heron



GLOSSY IBIS

- Nesting colony, 1983-1990

(Palmer 1962). Colony sites are usually occupied from April until July (Parnell and Soots 1979).

Glossy Ibis were first recorded nesting in North Carolina in 1940 at Battery Island near Southport (Pearson et al. 1959). By 1956, nesting numbers were increasing at Battery Island (Quay and Adams 1956). In 1977, when the first coastwide census was completed, there were 404 nests at 12 sites (Parnell and Soots 1979). By 1983, however, the number of nests had been reduced to an estimated 291, and the birds were nesting at only nine sites (Parnell and McCrimmon 1984). Surveys in 1988 showed a further reduction in the number of occupied sites, and incomplete census data indicated a further reduction in the number of nests to about 175 (Parnell and Shields, in press).

Although we are not sure of the cause of the decline in the Glossy Ibis population in recent years, we have noticed that in North Carolina this species is subject to heavy losses during inclement weather, and reproductive success is poor during wet, cool summers. Glossy Ibis also seem to be more sensitive to disturbance than other species in the multi-species colonies. They tend to leave nests more quickly upon disturbance and to return more slowly than most other species.

Recommendations. Nesting populations should be monitored closely, and work is needed to document causes of the decline. Colonies should be posted to prevent all unnecessary disturbances during the period of occupancy.



Glossy Ibis (J. F. Parnell)

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Prepared by JAMES F. PARNEll

BLACK VULTURE

Coragyps atratus (Bechstein)

Range and Habitat. Resident in tropical and warm temperate portions of the Western Hemisphere, the Black Vulture occurs in the southeastern United States and north to Maryland, West Virginia, southern Ohio, southern Indiana, and Missouri. Although found statewide in North Carolina, it is uncommon in the mountains.

In North Carolina Black Vultures prefer rural areas, particularly remote, swampy areas and partially wooded farmlands. Black Vultures are quite adaptable; they occur in large numbers in many urban environments of Central and South America.

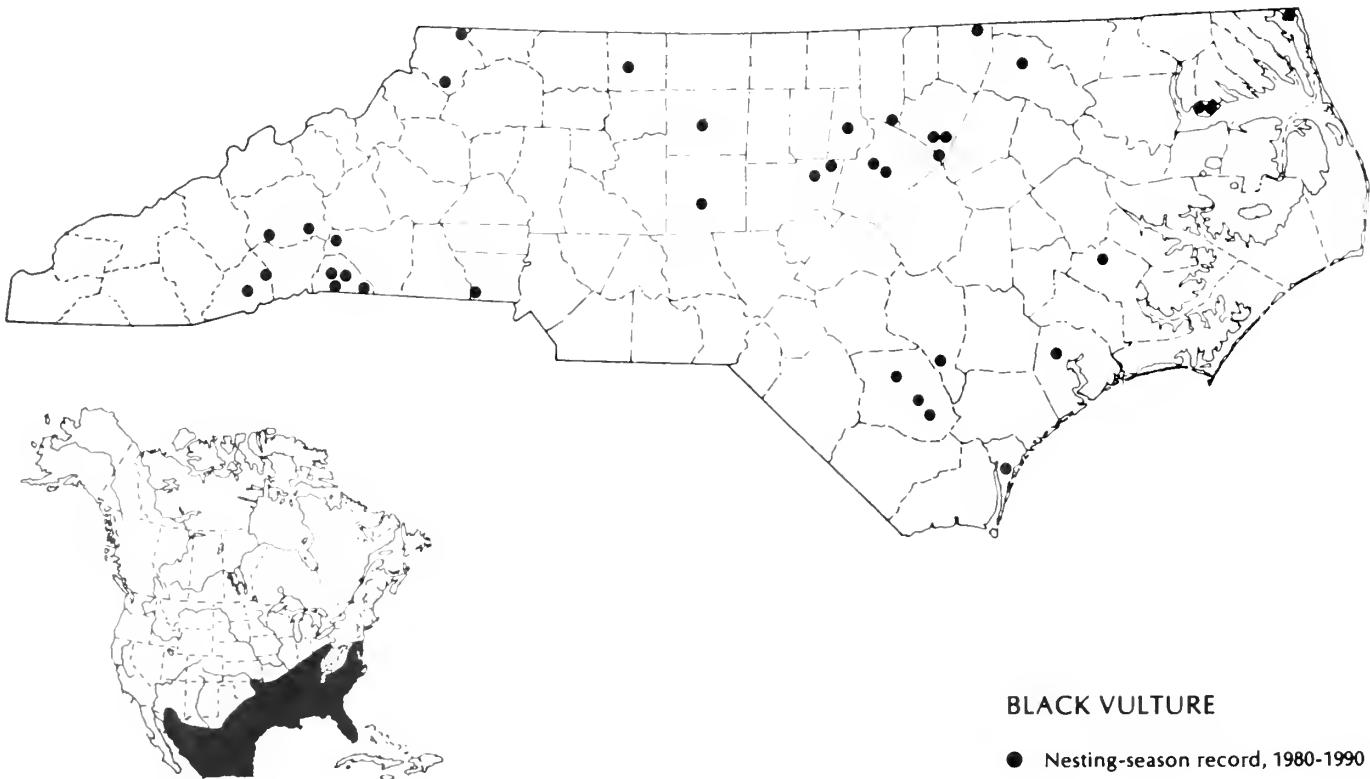
Life History and Ecology. Black Vultures are social animals, feeding and roosting in large groups. Roosting group membership is flexible as individuals attend many roosts within their ranges. Roost sites are traditional in the sense that the same site may be used for many years whenever food is available, but no one site is occupied every night. Pairs nest solitarily, the same pair returning to the same well-hidden location year after year. They produce one to three, usually two, eggs each year. Historically, nest sites include caves, large hollow logs or trees, and dense palmetto thickets. In the piedmont today, Black Vultures nest mostly in long-abandoned houses or barns, well overgrown with vegetation and far from human traffic. Nesting mortality usually occurs during the egg stage, and the chief predators are dogs. Incubation of 39 days is shared by both parents, young do not fly for approximately 90 days after hatching, and they may be seen near the nest site

for many weeks thereafter. Even after joining a roosting group, young remain dependent on their parents' assistance in feeding interactions within large feeding groups for several additional months (Rabenold 1986). Black Vultures usually feed in groups on large food items—single large carcasses or large piles of smaller ones.

Rationale for Evaluation. Although careful assessment of population trends has not been made, there exists a widespread impression that Black Vultures are not nearly as common as they once were. Almost 60 years ago a decline was noticed (Seeman 1929), and other more recent accounts agree (Carter 1971). Stewart (1984) provides some information on a decline in north central North Carolina; he found an average annual rate of decline between 1975 and 1980 of 20.2%. Summaries of Christmas Bird Counts can be used to suggest general trends, though they do not contribute toward estimating actual population size.

The summary in Table 3 is based only on those census areas that have been fairly regular since the late 1940s. Note particularly the sharp decline between the '50s and '70s in both the piedmont and the coastal plain. The number of Black Vultures sighted per 100 party-hours decreased from 10.3 during the 1946-1965 period to 2.98 during the 1966-1983 period, a 71% difference. While the population has declined statewide, a few local populations appear stable (notably those in the vicinity of Lake Mattamuskeet, Roanoke Rapids, and Chatham County). This suggests that we are not seeing a gradual decline throughout the state, but greater declines in some populations than in others.

The sharp decline probably resulted from the effects of pesticides on vulture eggs (Kiff et al. 1983) and from



BLACK VULTURE

● Nesting-season record, 1980-1990

Table 3. Christmas Bird Count summaries (Black Vultures per 100 party-hours) for North Carolina.

	1946-55	1956-65	1966-75	1976-83
Piedmont	8.45	7.21	2.64	1.80
Coastal plain	18.68	14.35	1.72	5.95

enforcement of sanitation laws requiring burial or removal of farm animals within 24 hours of death. The Chatham County population relies almost entirely on dead farm animals, primarily poultry, despite sanitation laws that make much of this resource unavailable (Rabenold 1984).

Continuing problems include the shortage of nest sites and the shooting of birds. The Chatham County population nests exclusively (based on more than 60 observed nesting attempts) in overgrown man-made structures. These structures are being lost at a much faster rate than suitable new sites are being created. The Black Vulture's long incubation and nestling stages (roughly 130 days) and its prolonged use of nest sites by the whole family after fledging make these sites focal points for individual families for almost the entire year. In fact, juveniles finally abandon the nest site at about the time parents begin preparation for the next season's clutch. Jackson (1983) suggests that both Black and Turkey Vultures have suffered lower nesting success since availability of large hollow logs or trees has declined and breeding pairs have moved into thickets and buildings. Shooting of birds in conspicuous roosting trees continues in spite of laws protecting vultures and other birds of prey. Many traditional roost sites have been entirely abandoned as a result of repeated acts of persecution.

Recommendations. Ensuring an adequate number of suitable nesting sites that are free of disturbance throughout the year is of primary importance in any management effort for Black Vultures. These adaptable birds might respond well to artificial nesting chambers placed in suitable habitat.

Supplemental feeding programs (Zimmerman 1975, Friedman and Mundy 1983) have been instituted with success to protect dwindling populations of Cape and Griffon Vultures in South Africa. Interestingly, community involvement there has resulted in open dumping of wastes from some slaughterhouses and meat-packing companies for vulture consumption. Conservation and sanitation interests need not be in conflict. If this sort of program is well controlled, vultures leave little objectionable material behind. Controlled feeding programs structured to comply with the intent of current sanitation laws are easily imagined. Large feeding sites surrounded by a double row of fencing would prevent spread of pathogens into the human food chain by barring entrance to pets and to domesticated animals raised for food.

Vulture roosts are conspicuous targets, and individuals are actually more vulnerable there to human persecution than on the ground in their well-hidden nests. Protection of roosting sites is imperative for maintaining the social order of Black Vulture groups. Specific proposals are lacking here. Community awareness of efforts to protect this well-known bird might reduce casual shooting of vultures in roosts.

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Prepared by PATRICIA P. RABENOLD



Black Vulture (J. F. Parnell)

COOPER'S HAWK

Accipiter cooperii Bonaparte

Range and Habitat. The Cooper's Hawk occurs in southern Canada and in the contiguous United States south to central Florida, northern Texas, and northwestern Mexico (AOU 1983). It is an uncommon winter resident throughout the Carolinas and a rare summer resident, found chiefly in the mountains (Potter et al. 1980).

This species inhabits mixed and deciduous forests and open woodlands, including small woodlots, in the eastern United States. Nests are usually near natural or man-made clearings (Meng 1951, Hennessey 1978) and are associated with mature forests that have a well-developed understory and ground-cover layer (Titus and Mosher 1981). During migration and in winter, Cooper's Hawks occur in almost any type of habitat containing trees or shrubs (Evans 1982).

Life History and Ecology. Data on North Carolina's breeding population is nearly nonexistent, consisting primarily of brief sightings of individual birds during the presumed breeding season. Virtually all records are from June and July (LeGrand 1983).

Based on studies of populations elsewhere in the species' range, Cooper's Hawks complete their clutch (average of 4.2 eggs) in mid-May (Meng 1951, Henny and Wight 1972, Henny et al. 1985). Incubation is primarily by the female and lasts 35 or 36 days (Meng 1951).

Sexual maturity usually is attained at 2 years of age, but 1-year-old birds sometimes attempt to breed (Mcng 1951, Hemphill 1966, Rosenfield and Wilde 1982). The

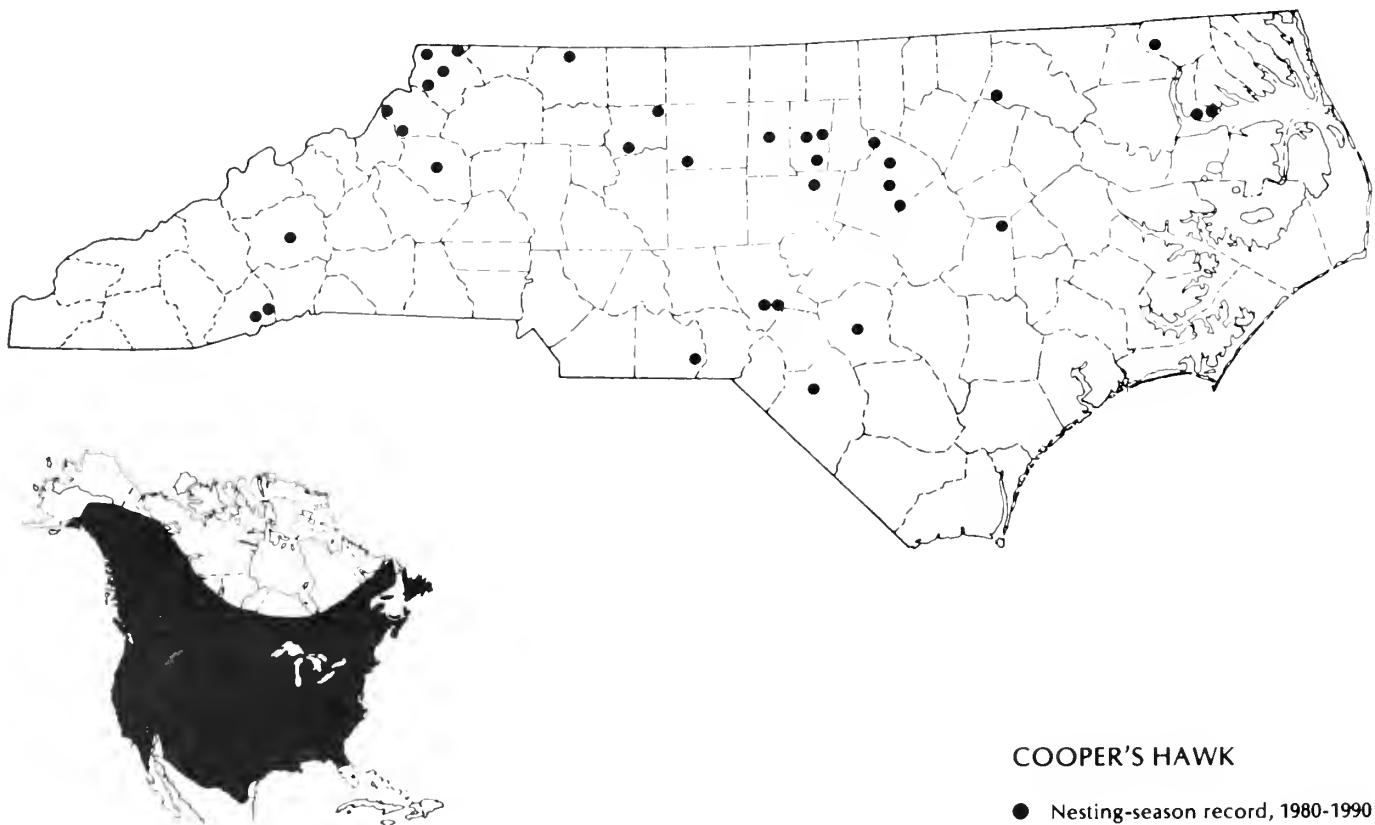
maximum recorded life span in the wild is 8 years (Henny and Wight 1972).

Eastern Cooper's Hawks feed primarily on birds (e.g. woodpeckers, thrushes, blue jays, quail, robins, and starlings), but they also take mammals, reptiles, and insects. Meng (1959) reported that the diet consisted of 82% birds and 18% mammals. Duncan (1966) examined the stomachs of 58 Cooper's Hawks and reported the contents as 64% birds, 33% mammals (mostly rodents), 10% reptiles and amphibians (mostly reptiles), and 10% insects (grasshoppers and beetles).

Rationale for Evaluation. In 1972, the Cooper's Hawk was placed on the Blue List, an early warning system for species showing substantial reduction in numbers (Arbib 1972). In North Carolina, it was designated as Threatened in 1977 (Parnell et al. 1977).

In the late 1930s and early 1940s, the Cooper's Hawk was one of the most common hawks across the state. Green (1939) reported it as the most abundant hawk nesting on Hatteras Island. He estimated that 10 pairs bred in the island's wooded areas. Numbers have declined significantly since that period; the species was categorized by Potter et al. (1980) "as a rare summer resident chiefly in the mountains." In recent years numbers have increased in certain sections of the country, prompting removal of the Cooper's Hawk from the Blue List in 1982, with retention in the Special Concern category (Tate and Tate 1982). However, there is no evidence of its recovery as a breeding species in North Carolina.

Two factors combined to reduce Cooper's Hawk numbers to low levels. Henny and Wight (1972) estimated that for



COOPER'S HAWK

● Nesting-season record, 1980-1990

Table 4. Numbers of migrating Cooper's Hawks reported in autumn at Hawk Mountain Sanctuary, Pennsylvania.

Time period	Birds per hour of observation
1934-1937	0.98
1938-1942	0.65
1943-1945	war years (no counts)
1946-1950	0.38
1951-1955	0.43
1956-1960	0.30
1961-1965	0.13
1966-1970	0.19
1971-1975	0.24
1976-1980	0.36
1981-1985	0.45

the period from 1941 to 1945 the annual rate of decline was 13.5%. They attributed the decline to illegal shooting. After 1947, following the onset of the widespread use of DDT, the reproductive rate dropped 24%, and the population declined at a rate of at least 25% annually. Other pressures included falconry (Evans 1982), ingestion of intentionally poisoned birds (Stone et al. 1984), nest predation by raccoons (Meng 1951), and striking glass windows and doors.

By the 1970s, Cooper's Hawk reproduction in the northeastern United States approached that of the pre-DDT era (Braun et al. 1977). Additionally, fall hawk migrations monitored since 1934 at Hawk Mountain Sanctuary indicate a reversal of the decline in the late 1960s (Table 4).

With reduction of organochlorine pesticides and illegal shooting in the United States, Cooper's Hawk numbers should continue to increase. However, recent articles, prompted by concern over bobwhite numbers, have identified the Cooper's Hawk in the popular press as a significant quail predator (Taylor 1985). Even though the author stresses habitat improvement as the best method for reducing predator pressure, it is impossible to predict how hunters will respond.

Recent evidence indicates that DDT is still being introduced into this country as a known impurity in the pesticide dicofol. DDT and related compounds can constitute as much as 15% of the pesticide (Bonney 1986).

Even assuming full compliance with bans against use of organochlorine pesticides in North America, there remains the problem of their widespread use in Central and South America. Exposure to these compounds affects migrants (Prouty et al. 1982). Accumulation of organochlorines from consumption of prey that has migrated to contaminated areas is possible for North American hawks. The likelihood of increased exposure to heavy metals, PCBs, and other environmental pollutants threatens many species, including the Cooper's Hawk.

Acknowledgments. I thank Laurie Goodrich, staff biologist at Hawk Mountain Sanctuary, for supplying the data summarized in Table 4.

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Prepared by TOM HOWARD

GULL-BILLED TERN

Sterna nilotica aranea (Wilson)

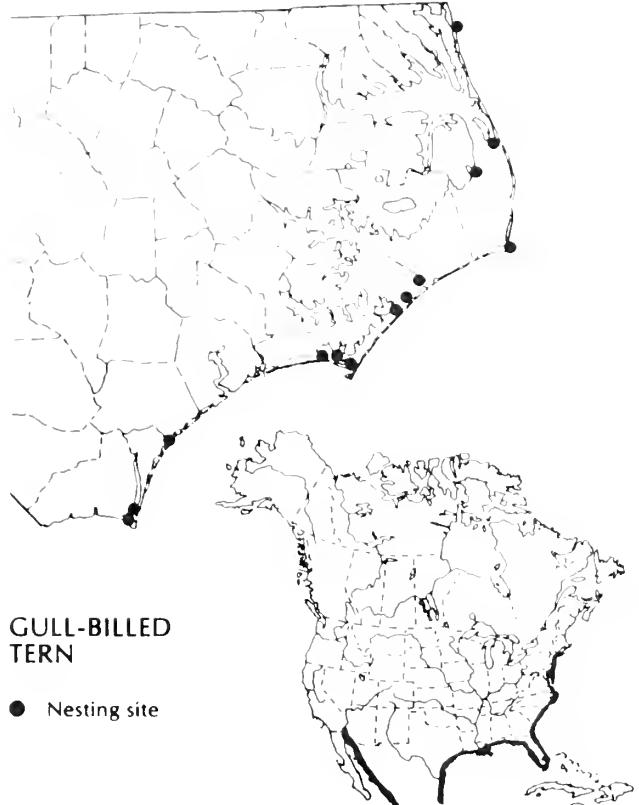
Range and Habitat. Gull-billed Terns are nearly cosmopolitan in their breeding distribution. In the eastern United States they breed along the coast from New York to Florida and across the Gulf Coast to Texas (AOU 1983). In North Carolina they nest from Brunswick County to Dare County (Parnell and Soots 1979) and migrate southward for the winter.

Gull-billed Terns were first reported nesting in North Carolina in 1909 in Dare County (Pearson et al. 1919). They were not reported again until 1933, when they were found nesting at Ocracoke (Pearson et al. 1942). Numbers and distribution increased, and in 1977, Parnell and Soots (1979) found 621 nests at nine sites. A subsequent survey in 1983 located only 223 nests (Parnell and McCrimmon 1984), and only 153 nests were located in 1988 (Parnell and Shields, in press).

Life History and Ecology. Gull-billed Terns are summer residents in North Carolina (Potter et al. 1980). They arrive in spring from wintering grounds along the Gulf of Mexico or in Central and South America (AOU 1983). They nest on bare, or nearly bare sandy islands or beach sites, usually near inlets or on overwash fans, or on natural, or more commonly, dredged-material islands in the sounds (Parnell and Soots 1979, Everhart et al. 1980). They often place their nests, shell-lined scrapes in the sand, in mixed colonies of Common Terns (*Sterna hirundo*) and Black Skimmers (*Rynchops niger*) (Soots and Parnell 1975). Nesting begins in May, and two or four eggs are usually laid. Incubation



Gull-billed Tern (J. F. Parnell)



requires 4 to 5 weeks (Reilly 1968). Colonies may be occupied into August (Parnell and Soots 1979).

Rationale for Listing. Populations have declined since 1977 when the first coastwide census was conducted in North Carolina (Parnell and Soots 1979; Parnell and McCrimmon 1984; Parnell and Shields, in press). In 1977, Gull-billed Terns were nesting primarily on dredged-material sites created and maintained by the U.S. Army Corps of Engineers. Changes in practices of disposing of dredged material are resulting in fewer sites with bare substrates along the coast, and there is concern that nesting habitat may become scarce. Nesting birds are also in jeopardy from increased disturbance by people and from flooding by storm tides, especially on the generally low-elevation colony sites along the beaches.

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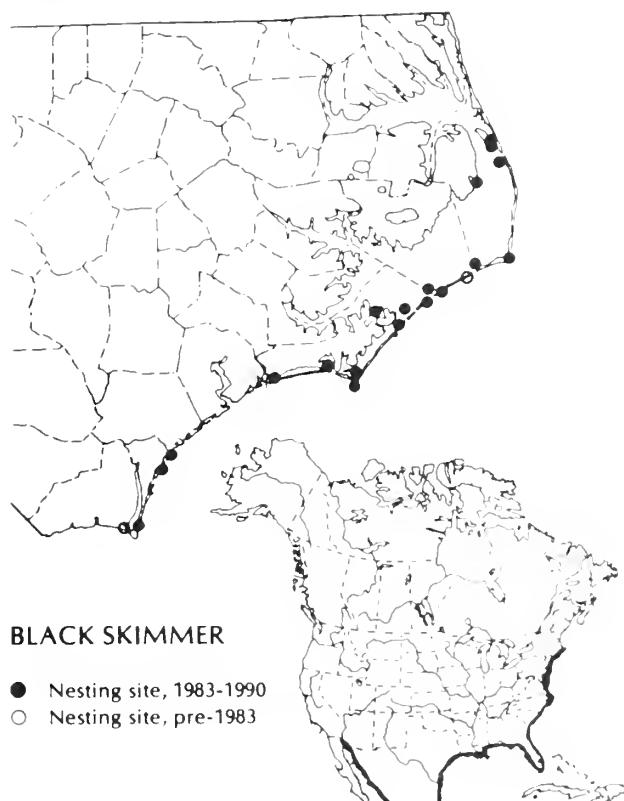
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Prepared by JAMES F. PARNEll

BLACK SKIMMER

Rynchops niger Linnaeus

Range and Habitat. Black Skimmers nest from New England to Florida and across the Gulf of Mexico to Texas. Wintering birds may be found from North Carolina southward (AOU 1983). The species was reported to be relatively common along the Outer Banks in the early 1900s (Pearson et al. 1919). It now nests along the immediate coast from Brunswick County to Dare County (Parnell and Soots 1979).





Black Skimmer (J. F. Parnell)

Life History and Ecology. Black Skimmers may be found along the coast of North Carolina at all seasons (Potter et al. 1980). Nesting usually begins in April or May, but the onset is very erratic; in some years at some sites, nesting may be initiated well into July (Parnell and Soots 1979). Nests are shallow unlined scrapes, and two to four eggs are usually laid. Incubation requires about 23 days and 23 to 25 days are required for the young to achieve flight (Erwin 1977). Colony sites may be occupied well into September.

Black Skimmers have nesting requirements similar to those of Common (*Sterna hirundo*) and Gull-billed (*S. nilotica*) Terns, and the three species often nest together (Soots and Parnell 1975, Parnell and Soots 1979, Everhart et al. 1980). Colonies are usually located on beaches adjacent to inlets, on overwash fans, or on bare natural or dredged-material islands (Parnell and Soots 1979).

Rationale for Listing. Problems faced by Black Skimmers are very similar to those faced by Gull-billed Terns. See that account for a summary.

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Prepared by JAMES F. PARNEll

NORTHERN SAW-WHET OWL *Aegolius acadicus acadicus* (Gmelin)

Range and Habitat. Northern limits of the breeding range of the Saw-whet Owl are from British Columbia to southeastern Alaska. Southern limits, in the east, are New Jersey, Pennsylvania, and, in the Appalachian Mountains, from Maryland south to North Carolina and Tennessee (Great Smoky Mountains). Southern limits in the western part of the continent vary because of the complex nature of major mountain chains (AOU 1957). The nominate race is found throughout much of the North American range.

Breeding records for North Carolina are based on territorial calling, plus a few reports of sightings of immature birds during the summer. These have come from scattered western counties including Avery, Buncombe, Graham, Haywood, Jackson, McDowell, Mitchell, Swain, Transylvania, and Yancey (Simpson 1968, 1972, 1974; NCSM records).

In the southern Appalachians, the Northern Saw-whet Owl lives in coniferous forests and deciduous hardwood forests (LeGrand and Hamel 1980); it frequents dense to open vegetation. In North Carolina, this owl occurs in isolated pockets of boreal forests over 5,000 feet above sea level. Although, it primarily inhabits the spruce-fir forests, it also occurs in hardwood transition zones. Breeding sites appear to be confined to mature forest with a well-developed understory and with trees generally 9 to 11 inches or larger in diameter (Simpson 1972).

Life History and Ecology. The following information is summarized primarily from Bent (1938). The Northern Saw-whet Owl nests in cavities in dead trees and snags. Such cavities are generally located 14 to 60 feet above the ground. This species is also known to use bird boxes, and rarely rock cavities.

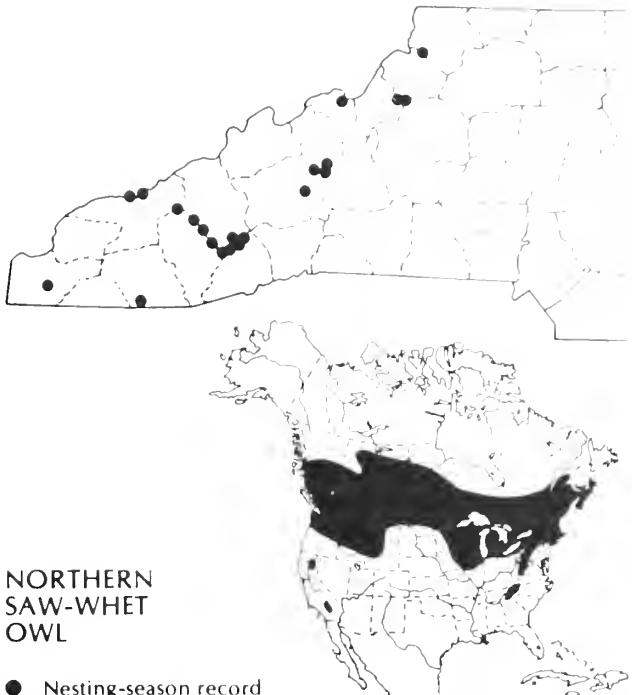
The three to seven (usually five or six) eggs are oval to nearly spherical in shape and 29.9 x 25.0 mm (1.18 x 1.00 inches) in size; the smooth shell is white with little or no gloss.

The primary call is a narrowly whistled, resonant, bell-like cooing note (*too, too, too*) repeated mechanically in almost endless succession throughout the breeding season. It is often issued 100 to 130 times per minute (1-2 second), and calling may continue for several hours on a calm night. Though it is not often uttered, there is another call, the one for which this owl has been named, that resembles the sounds made filing a large saw. It is a penetrating, rasping call given in triads (*scree-kaw, scree-kaw, scree-kaw*). Other cooing, clucking, and jingling sounds and faint screams are heard mostly in and around the nest site.

In the southern Appalachians, birds abandon their high-elevation summer territories and move to lower elevations. Reports published in *The Chat* (1960-1984) indicate that Northern Saw-whet Owls reach their wintering grounds in North Carolina from mid-October to mid-November. They generally depart for their nesting territories from mid-March to mid-April. Vertical population movements in North Carolina to mountain breeding grounds also take place during March and April (*Chat* 29:110-111). Calling males herald the onset of a new breeding season as early as February or March on portions of the breeding range. Calling does not occur in the highlands of North Carolina until about the first week of April. Courtship is both lively and noisy.

Males apparently set the territory by establishing calling stations, and females have the dominant role in incubating eggs. Incubation commences with the laying of the first egg with additional eggs laid at intervals of 1 to 3 days. That results in having young of various ages and sizes in the nest. Egg laying occurs generally from late March through early July over the breeding range. Without the discovery of nesting birds in North Carolina, the nesting period can only be presumed, on the basis of calling birds, to last from April through mid-June.

Estimated time of incubation is 21 to 28 days. After 17 days the birds molt gradually into the juvenal, or "white-fronted," plumage; the molt requires about 25 days for completion. Young birds are capable of flight when 20 days old. Nest departure generally takes place about 30 days (27-



Northern Saw-whet Owl

(A. Cruickshank/VIREO)

34 or more days) after hatching. The end of the calling period during April for the northern portion of the range coincides roughly with the hatching of the young, which suggests a male role in the feeding of young birds. In North Carolina, birds in juvenal plumage have been reported in mid-July and early September.

Rationale for Evaluation. The rather apparent restriction of summer populations of the Northern Saw-whet Owl in North Carolina to the higher elevations places it within the spruce-fir forest and the high-elevation transition forest. Of the original spruce-fir areas in the Southeast, it is estimated that only some 10% remains. Through the years a number of reasons have been proposed to explain the shrinking of the area occupied by spruce-fir forests: environmental changes resulting from timber removal, blights, insect infestations, and, more recently, pollution, including acid rain. These forests appear to be relicts of the last Ice Age, and as such they could eventually be eliminated by progressive warming of the climate, a process apparently being accelerated by the "Greenhouse Effect." Although it has been determined that this owl makes considerable use of the transition zone, its ability to adapt to using this zone exclusively is unknown.

At the present time, plans for management or recovery projects seem premature. What is needed is a thorough inventory, followed by an investigation of ecological requirements. The following steps are suggested:

1. Organize an inventory of the summer populations.
2. Where densities appear sufficiently high, or where the nature of the area will permit a thorough canvass, nesting birds need to be found.
3. Once nesting is confirmed, population and life-history studies are needed to document critical needs of the species at the southern limit of its range.
4. From the inventory, formulate management plans, which will likely be centered on critical and limiting factors in the natural history of this species to include such practices as setting out nest boxes and initiating long-term management of forest successional stages.

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OLIVE-SIDED FLYCATCHER

Contopus borealis (Swainson)

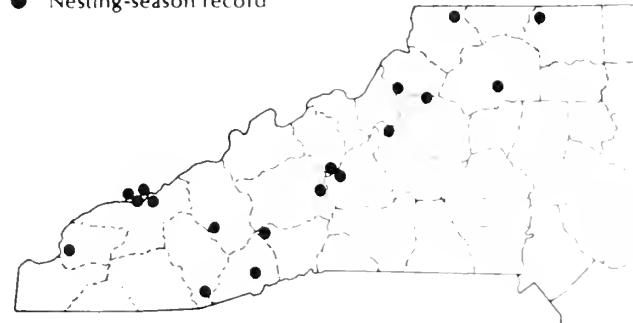
Range and Habitat. This boreal species breeds generally throughout the spruce-fir zone in North America from Alaska to Newfoundland south through the mountains of the western United States and to Michigan and New York. Its range is very spotty in the Appalachians south of New York, though it occurs south to Tennessee and North Carolina (Great Smoky Mountains). It winters in the tropics (AOU 1983).

The Olive-sided Flycatcher is a rare summer resident in the Great Smoky Mountains National Park. Recent summer occurrences (all in the mountains) away from the park have been sporadic, one-time-only reports, possibly of wandering birds or late transients. The species may breed on Roan Mountain, on Grandfather Mountain, and in Linville Gorge; there are single recent sightings from each site, and apparently suitable habitat is present. Prior to 1930, the Olive-sided Flycatcher was more widespread in the mountains, though it has always been a rather rare bird in the state, which is at the extreme southeastern edge of the breeding range.

This is a species of mature spruce-fir forests, yet it requires openings or numerous dead trees in breeding territories. It may also occur occasionally in white pines or other conifers, where openings are present. Areas with numerous dead trees are increasingly common at high elevations, owing to insect damage, fires, windstorms, and

OLIVE-SIDED FLYCATCHER

● Nesting-season record



Prepared by PHILIP J. CRUTCHFIELD



Olive-sided Flycatcher

(O. S. Pettingill/VIREO)

possibly acid precipitation (Pyle and Schafale 1985). Thus, suitable breeding habitat seems plentiful in North Carolina.

Life History and Ecology. Olive-sided Flycatchers build nests on a horizontal limb of a conifer, typically a spruce or fir. The nest is usually placed fairly high above ground, making it very difficult to find. Three eggs are usual, and they hatch in 16 to 17 days. This species feeds on flying insects, which it detects from a high and exposed perch and then sallies out to capture. Olive-sided Flycatchers characteristically perch on dead snags, especially at the very top of a tree. They are aggressive and may drive away other birds in the vicinity of a nest. No nest has ever been found in North Carolina; evidence of breeding has been sparse and conjectural. However, an active nest was found in the early 1980s on Mount Le Conte, on the Tennessee side of the Great Smoky Mountains National Park, to establish beyond doubt that breeding occurs in the southern Appalachians (Williams 1976).

Rationale for Evaluation. The Olive-sided Flycatcher is considered of special concern both because of its apparent long-term decline in the southern Appalachians (McNair 1987) and because of the recent, alarming death of many spruce-fir forests in the state. The species was more numerous in the late nineteenth century than at any time since. Even in the early 1960s, Stupka (1963) considered the Olive-sided Flycatcher "by no means a rare breeder" in the Great Smoky Mountains National Park. However, records from the park in the last 20 years have been quite rare (fewer than one per year on the North Carolina side). This apparent decline has no known cause. More alarming is the fact that since 1980, spruce and, to a greater extent, fir trees in the state (especially on Richland Balsam and Mount Mitchell) have been dying, a result of injury by the balsam wooly aphid and possibly by acid rain. Some death of spruce and

fir trees may actually be beneficial to the Olive-sided Flycatcher; yet, the nearly total loss of acres of that forest type would be harmful to the species as a breeder in North Carolina.

Breeding populations of the Olive-sided Flycatcher south of the Adirondack Mountains are very local and disjunct. Scattered pairs nest in West Virginia and presumably in Tennessee and North Carolina, but Virginia seems to have no breeding population. Thus, the very small population in the Smokies appears to be disjunct by several hundred miles. In addition, the species is a very rare migrant in the Southeast and is seldom seen in North Carolina.

Recommendations. Because Olive-sided Flycatchers have always been scarce in the southern Appalachians, there are few recommendations for increasing populations. Suitable breeding habitat appears to be present, and many areas where the birds occur or have occurred (such as Roan Mountain, Linville Gorge, and Great Smoky Mountains National Park) are on protected, public lands. The primary need appears to be to determine the cause of the death of fir and spruce trees and to protect that habitat type. Further exploration of remote sections of the high mountains, such as the Appalachian Trail east of Clingmans Dome, are also needed to determine population levels.

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Prepared by HARRY E. LEGRAND JR.

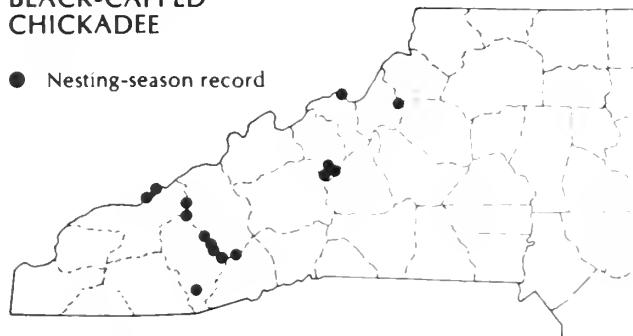
BLACK-CAPPED CHICKADEE

Parus atricapillus practicus (Oberholser)

Range and Habitat. This is a widespread species in the northern United States and Canada, occurring south to California, Missouri, and northern New Jersey. *Parus atricapillus practicus* occurs from Ohio and Pennsylvania southward in the southern Appalachians to southeastern Tennessee and southwestern North Carolina (AOU 1957). Although some northern birds move southward in winter, the species is chiefly nonmigratory.

BLACK-CAPPED CHICKADEE

● Nesting-season record



In North Carolina *P. a. practicus* is a fairly common and nonmigratory permanent resident of the Great Smoky Mountains National Park, occurring eastward to the Plott Balsams and the southern end of the Great Balsams (vicinity of Devil's Courthouse) (Simpson 1977). Several pairs were recently found on Grandfather Mountain (Lee et al. 1985). Black-capped Chickadees formerly occurred in the spruce-fir zone on other mountains (Simpson 1977). The Black-capped Chickadee breeds primarily in mature spruce-fir forests, and in the Smokies it is widespread in mixed hardwood-conifer forests at elevations above 4,500 feet. It also nests in hardwood forests above 4,000 feet in the Smokies. Outside the Smokies, it is almost entirely limited, in North Carolina, to spruce-fir forests or to places above 5,000 feet where those trees are mixed with hardwoods.

During winter, Black-capped Chickadees in the Smokies descend to lower elevations and sometimes associate with Carolina Chickadees (*P. carolinensis*). The extent of southward migration into the mountains in winter (from areas north of the state) is not known. There are numerous winter records from the mountains away from known breeding areas, but those likely include misidentified Carolina Chickadees.

Life History and Ecology. Black-capped Chickadees nest in cavities, usually dug by the birds themselves, in dead trees or stumps. No active nest has ever been found in North Carolina, but nests in Tennessee in the Great Smoky Mountains National Park were built in yellow birch (*Betula lutea*) (Tanner 1952). Five or six eggs are usually laid. Black-capped Chickadees are generally insectivorous; they

feed on adults in season and on insect eggs and larvae in the bark and along twigs of trees when adult insects are scarce during cold weather.

Rationale for Evaluation. This chickadee is a widespread breeder south to West Virginia and adjacent Virginia. A disjunct relict population ranging from the Smokies to the Great Balsams is fairly healthy, but populations on Mount Rogers, Va., and on Grandfather Mountain, N.C., are very small. Some birds collected in the Plott Balsams (Tanner 1952) and seen and heard calling and singing in the Great Balsams (LeGrand 1974) appear to be hybrids. Though they have characteristics of both species, these chickadees are much closer in appearance to the Black-capped than to the Carolina. A study of the populations in the Plott Balsams and the Great Balsams has not been made to determine whether the birds there are actually "pure" *P. atricapillus*. Another special feature of chickadee distribution in the state is that the breeding ranges of the two species are apparently mutually exclusive; the Black-capped Chickadee breeds only in areas where the Carolina Chickadee does not. It is not clear which species excludes the other, if such is the case; however, the Carolina Chickadee does breed at high elevations (at least up to 6,000 feet) in some mountain ranges where the Black-capped Chickadee is absent (Potter et al. 1980). Despite the Black-capped Chickadee's being a fairly common bird in parts of the state, no active nest has ever been reported; however, Tove (1980) confirmed breeding in North Carolina by finding a fledgling at Richland Balsam.

Black-capped Chickadees were somewhat more widespread in the state's spruce-fir zone in the early decades



Black-capped Chickadee

(J. D. Young/VIREO)

of this century than during recent ones. Logging and fires reduced the extent of this habitat several decades ago; now disease and acid rain, or a combination of the two, are killing fir trees and further reducing the habitat (Pyle and Schafale 1985). Though there has been no evidence of a decline in the Black-capped Chickadee population within the last decade or two, there is much concern over the loss of habitat. Populations of the birds are expected to decline as suitable habitat dwindles.

Recommendations. The cause of the death of fir and spruce trees should be determined, and efforts should be implemented to prevent further loss of that habitat. Black-capped Chickadees occur mainly on protected lands owned by the National Park Service; thus, protection of remaining habitat does not require the cooperation of private land-holders. It is not known whether suitable nesting substrates (dead trees or stubs) are a limiting factor, though likely they are not. Nonetheless, the species might be enticed to use nest boxes placed in spruce-fir habitat, as chickadees commonly breed in such boxes in other parts of the range.

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Prepared by HARRY E. LEGRAND JR.

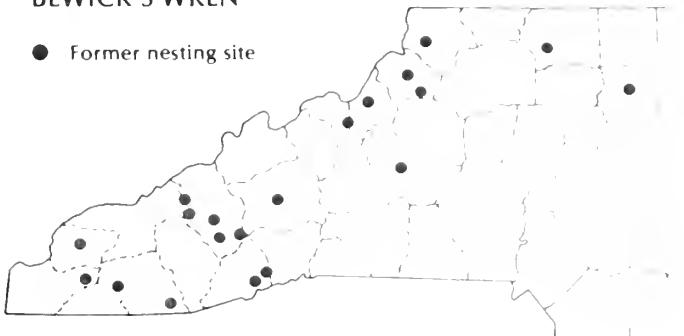
BEWICK'S WREN

Thryomanes bewickii altus Aldrich

Range and Habitat. This widespread species occurs from the Pacific Ocean eastward to the Appalachian Mountains (from Pennsylvania southward—*T. b. altus*). Bewick's Wren is nonmigratory in the western half of its

BEWICK'S WREN

● Former nesting site



range, but east of the Mississippi River it withdraws from the northern portion of the range to winter in the Gulf States.

In North Carolina in the early decades of the twentieth century, this wren nested commonly throughout the mountains and sparingly in the western piedmont; it wintered rarely in the state (Pearson et al. 1959). By the 1950s it had become very uncommon, and by 1970 it was very seldom seen (Simpson 1978). Currently it is considered to be a very rare, if not extirpated, summer resident in the mountains, mainly at high elevations. It no longer nests in the piedmont, nor does it winter in the state. The last record of a bird known to have been on territory in North Carolina was in 1971 (Chat 35:115). A few spring and summer records since that date are perhaps of wandering birds looking for mates. A recent "breeding" record for Watauga County (Chat 46:106-108) is erroneous; LeGrand has determined the birds to have been Carolina Wrens (*Thryothorus ludovicianus*), based on examination of color slides and taperecordings of the birds.

Bewick's Wrens formerly (in the nineteenth century and early twentieth century) nested in towns, cities, and rural areas in the mountains, especially in bird boxes and around sheds and barns. By the 1930s the species had become scarce, and by the 1950s almost all nesting birds were found away from towns. The breeding birds had moved from valleys to high elevations (above 3,500 feet); most were found in pastures, farmyards, and clearings. Fences, brushpiles, and old barns or sheds were often present in the habitat. The species is to be looked for primarily in the

northernmost mountain counties of North Carolina, in high-elevation farmyards and pastures.

Life History and Ecology. Bewick's Wrens are migratory in the eastern United States, arriving on the breeding grounds in March and April and departing usually in October. They nest in a variety of cavities, nooks, and crannies. They will build in tree cavities or bird boxes, but they also place nests in crannies in old buildings and other structures. There are generally five to seven eggs per clutch. The birds feed on a wide variety of insects gleaned within 10 feet of the ground (Bent 1948).

Rationale for Evaluation. Because the habitat of this wren has always seemingly been abundant in North Carolina and throughout the southern Appalachians, its decline has generally been attributed to competition with other bird species. However, a difference of opinion exists as to which birds have been responsible for displacing with the Bewick's Wren (Simpson 1978). House Wrens (*Troglodytes aedon*), House Sparrows (*Passer domesticus*), and European Starlings (*Sturnus vulgaris*) have frequently been mentioned. Carolina Wrens (*Thryothorus ludovicianus*) and Song Sparrows (*Melospiza melodia*) are other species that have been considered as competitors. There are varied factors that argue against each of these species as a sole competitor; thus, the cause of the decline is not well understood. The species still occurs in a few places in Virginia, and it is certainly possible that a few pairs still breed in North Carolina in high-elevation pastures and clearings. Perhaps no other breeding bird in North Carolina has declined as precipitously in this century as has the Bewick's Wren.

Recommendations. At present, the Appalachian Bewick's Wren (*altus* race) is a candidate for federal listing. Additional information on populations and threats are needed before a decision on listing can be made by the U.S. Fish and Wildlife Service. At present, no recommendations can be made that would enable the species to regain former numbers in the East. Habitat for breeding appears to be abundant. To obtain a better understanding of the problems facing the Bewick's Wren, the search for it in mountain counties (particularly Ashe, Watauga, and Avery) should be intensified.

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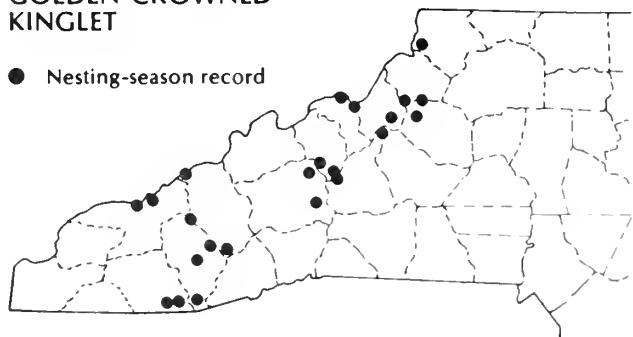
GOLDEN-CROWNED KINGLET *Regulus satrapa satrapa* Lichtenstein

Range and Habitat. This is a widespread species of the boreal zone, nesting from Alaska and California eastward to the Appalachian Mountains and Newfoundland. In the Appalachians it nests southward to extreme southwestern North Carolina.

In western North Carolina it is a fairly common to common breeding species in the spruce-fir zone. It also nests less commonly in some hemlock and white pine forests, but is local in such habitats (Simpson 1976). Most of the population occurs above 4,500 feet, though nesting pairs are present as low as 3,200 feet at Linville Falls. The species winters throughout the state in large numbers, in coniferous and in mixed hardwood-conifer forests (Simpson 1972, 1976; Potter et al. 1980).

GOLDEN-CROWNED KINGLET

● Nesting-season record



Life History and Ecology. Golden-crowned Kinglets build a cup-like nest on a branch of a spruce, fir, or other coniferous tree, generally fairly high above ground. Six or more eggs are normal, with clutch size varying from five to ten. Relatively little evidence of nesting is available in this state. Nests are very small and difficult to locate among the thick foliage of spruce and fir trees.

Rationale for Evaluation. The Golden-crowned Kinglet is listed of Special Concern in North Carolina because most of its breeding population is restricted to spruce-fir forests,



Golden-crowned Kinglet

(Johann Schumacher/VIREO)

which are presently being severely damaged. Because of the continuing death of large numbers of fir and spruce trees in the state, the breeding population of the kinglet is in jeopardy and almost certainly is declining, though few, if any, studies have been made to determine recent kinglet populations. This species, along with other small insectivorous species that winter in North Carolina, often becomes reduced in numbers in late winter. Such mortality, which often manifests itself in reduced breeding populations in the nesting range during the following summer, is generally not a long-term decline; populations usually return to normal in 1 or 2 years.

This kinglet is one of the most common and characteristic breeding birds of mature spruce-fir forests; therefore, it is a good indicator of the well-being of this vegetation zone.

Recommendations. Research is needed to determine why fir and spruce trees are dying in North Carolina's mountains and to discover ways to prevent further loss of this habitat. Most of the spruce-fir forests in North Carolina are in public ownership; thus, protection of suitable habitats from development is not considered a major concern.

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Prepared by HARRY E. LEGRAND JR.

LOGGERHEAD SHRIKE

Lanius ludovicianus migrans Palmer

Lanius ludovicianus ludovicianus Linnaeus

Range and Habitat. The Loggerhead Shrike formerly bred from northern Washington, across the southern Canadian Provinces, east to southern Maine, northwest Massachusetts, western Connecticut and New Jersey, and south to southern Baja California, throughout Mexico and Veracruz to the Gulf Coast and southern Florida (AOU 1983). Since the middle of the twentieth century, significant withdrawal in breeding range has occurred in the eastern United States at least as far south as North Carolina; any breeding in the Northeast has become noteworthy.

In North Carolina, the eastern piedmont section currently supports most of the breeding pairs remaining in the state. The species is scarce in most of the coastal plain, and it remains, as has been the case for more than 100 years, virtually absent as a breeding bird in northeastern North Carolina.

Wintering Loggerhead Shrikes seem to prefer the same parts of the state as do breeding birds (personal observations).

The precise limits of the two races in North Carolina are unknown. Pearson et al. (1942) suggest the possibility that *L. l. migrans* bred sparingly in the mountains of North Carolina. They point out that Burleigh documented its occurrence irregularly in spring, fall, and winter in Buncombe County. *Lanius l. ludovicianus* breeds in the piedmont and the coastal plain.

The Loggerhead Shrike is typically found in open areas, frequently in upland grasslands where hedgerows and dense shrubs serve as borders. Open deciduous woodlots adjacent to fields appear to be desirable as nest and roost sites. In North Carolina, pasture and agricultural tracts are attractive, especially if hedgerows are allowed to develop. Eastern red cedar (*Juniperus virginianus*), characteristic of fence-hedgerows in this state, are especially attractive to shrikes. Kridelbaugh (1983) points out the value of cedars as nesting and roost sites. The closely cropped grasses of pastureland allow shrikes to forage successfully for terrestrial insects, primarily Coleoptera and Orthoptera. Barbed-wire fences and thorn-bearing trees provide places for impaling prey. Hedgerows also serve as prime habitat for small birds and rodents, significant prey items for shrikes during those times when cold temperatures virtually eliminate opportunities for insects to be taken.

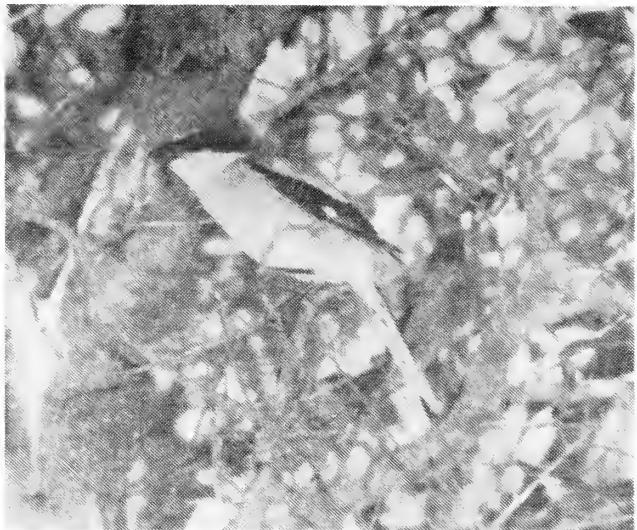
Life History and Ecology. The Loggerhead Shrike is an opportunistic feeder on a great variety of prey, both vertebrate and invertebrate. Insects, small mammals, small birds, amphibians, and reptiles are skillfully dispatched by this efficient passerine "raptor." Fences, electric wires, and isolated trees serve as observation and hunting perches throughout the year. The extraordinary vision demonstrated by this bird in hunting has been addressed by many authors (e.g. Pearson et al. 1942, Bent 1950). Use of small sharp objects, such as thorns and barbs on fences, allows impaling as an aid in eating prey items too large to manipulate otherwise.

Loggerhead Shrikes nest earlier than most passerines, with nest construction usually under way by mid-March in

Wake County. False nests, nests constructed over the remains of old ones, and nests constructed in new sites but incorporating old nest materials have been documented in Wake County (personal observations). The typical nest is a rather bulky structure, usually placed near the end of a tree limb, 9 to 15 feet above the ground. Both sexes are usually involved in the construction. The nest is often conspicuous, owing to the shrike's penchant for including long strands of string or large fragments of paper in the basal portion.

The female usually produces five or six eggs in the first clutch, with a reduction of one in the second clutch. Double broods are the norm in Wake County (personal observations). Incubation commences as the final egg is laid. The average incubation time is 13 days. The male feeds the female as she incubates and provides the nestlings and the female with food for the first few days after hatching, while she constantly broods the young. Such strategies, along with determined defense of the nest and contents, ensure a high rate of survival in young shrikes prior to fledging.

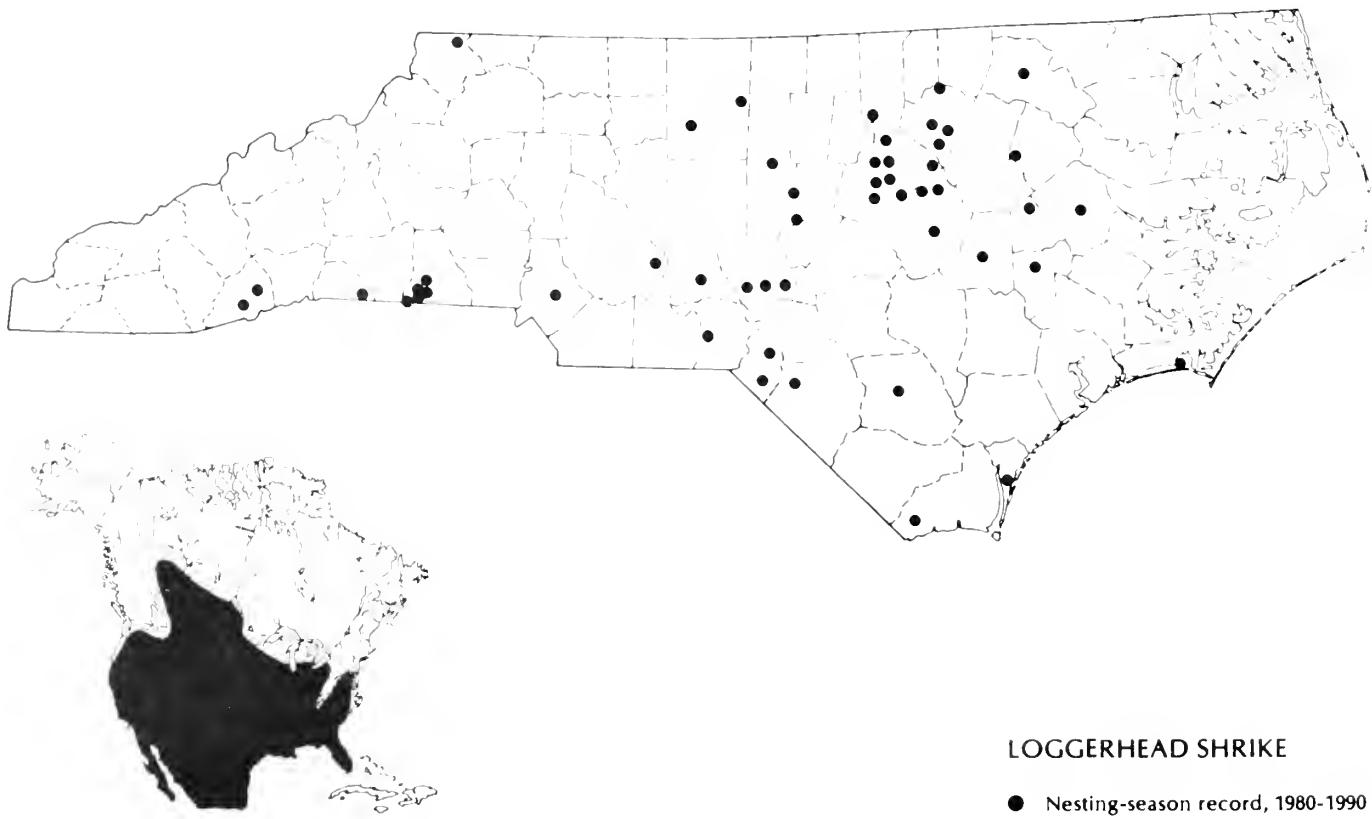
Rationale for Evaluation. Analysis of data from Christmas Bird Counts clearly indicates a significant drop in numbers of Loggerhead Shrikes in the South Atlantic States, an important wintering area of the eastern North American breeding stock of this species (Morrison 1981), including both *L. l. ludovicianus* and *L. l. migrans*. North Carolina is near the northern boundary of present-day populations of breeding Loggerhead Shrikes in the eastern United States. Within the state, there appears to have been



Loggerhead Shrike

(J. F. Parnell)

a significant reduction in numbers of nesting pairs in the mountains, western piedmont and inner coastal plain. The eastern piedmont area currently seems to support the largest number of breeding pairs. The alarming change in North Carolina populations in the past few decades warranted categorization of this animal as a species of Special Concern (Parnell et al. 1977).



LOGGERHEAD SHRIKE

● Nesting-season record, 1980-1990

There is an interesting parallel in the population dynamics of the Loggerhead Shrike and the Bachman's Sparrow (*Aimophila aestivalis bachmani*). As the eastern deciduous forest was cleared for lumber, agriculture, and animal husbandry, an opportunity for extensive range expansion for these two species was provided. For both species, the recent decrease in breeding range may be an adjustment downward to, or toward, the ancestral one.

Recommendations. I have personally witnessed the disappearance of breeding shrikes from a traditional breeding site because of "sanitization" of a section of pasture fence lines at one of the NCSU dairy facilities in Wake County. Several hundred yards of dense hedgerows (mainly *Smilax* sp.) were completely stripped, followed by herbicide application. The result was a sterile fence line and no shrikes.

Loggerhead Shrikes appear to be quite sensitive to disturbances in habitat, and one effort to aid them could be an aggressive campaign to locate the remaining traditional breeding sites and to preserve those sites from physical alterations or encroachments. The second phase might involve identification of areas where shrikes have bred and consideration of restoring hedgerows, shrubs, short grasses, and thorn-bearing trees. Placement of sections of barbed-wire fencing would provide permanent artificial thorns and hunting perches.

Fecundity and successful fledging of young do not appear to be a problem for pairs I have studied. There is clear evidence that surplus Loggerhead Shrikes are being produced in Wake County each breeding season. Wise manipulation of habitat, especially on state-owned farm systems, could provide an opportunity to devise a statewide program for restoration of habitat for this species.

In summary, I feel that the Loggerhead Shrike is capable of replacement, in numbers, of lost breeding stock. The key is to provide additional suitable breeding habitat for the surplus young of the year. Obviously, improved habitat in North Carolina would additionally provide ideal wintering areas for migrants from farther north, thus improving their winter survival potential.

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Prepared by E. WAYNE IRVIN

BACHMAN'S SPARROW

Aimophila aestivalis bachmani (Audubon)

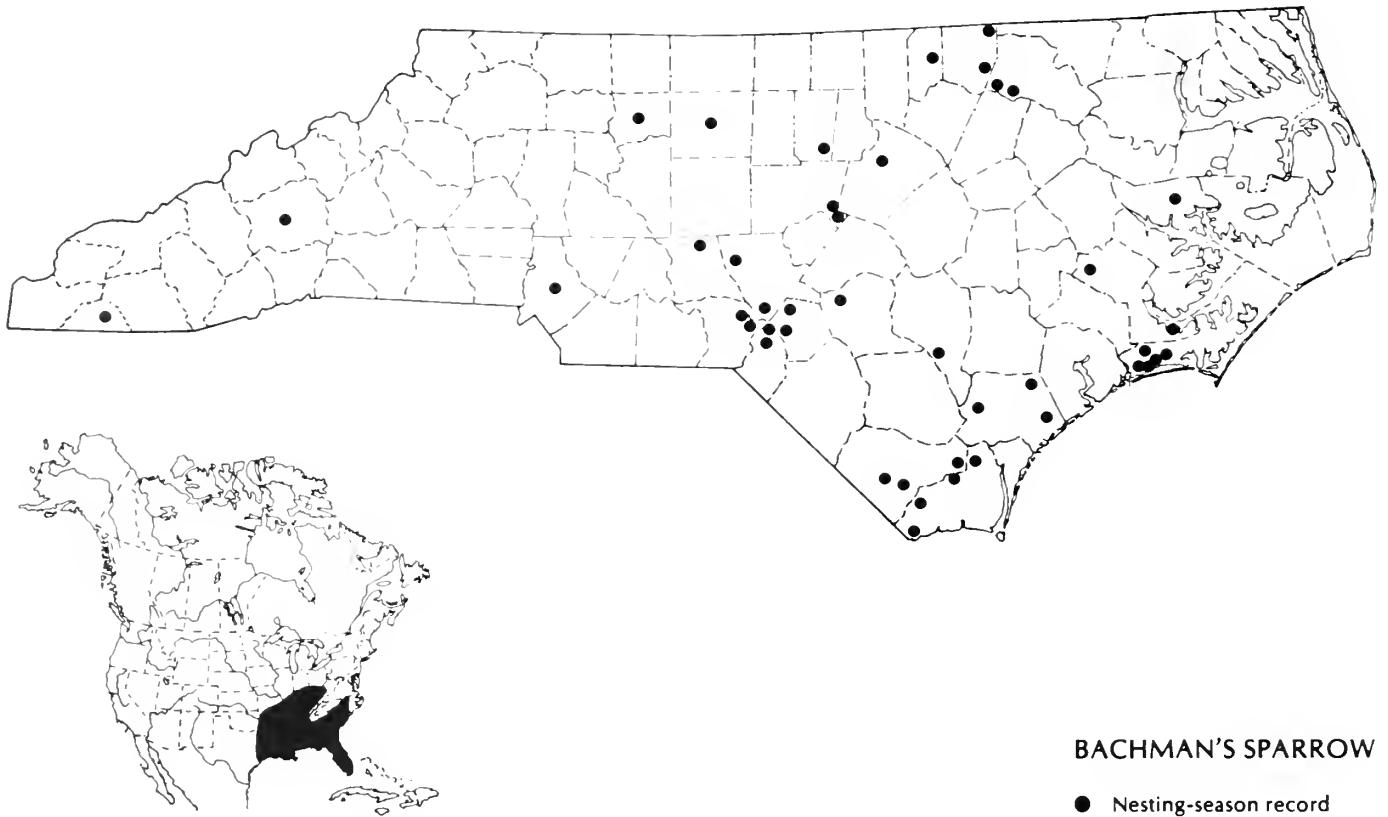
Range and Habitat. Formerly this sparrow nested from south-central Missouri, central and northeastern Illinois, central Indiana and Ohio, southwestern Pennsylvania, and central Maryland, south to eastern Oklahoma, eastern Texas, the Gulf Coast, and south-central Florida. It is now generally absent as a breeder in the northeastern portion of its former range, that is north of southern Kentucky and North Carolina. The species winters from eastern Texas, the Gulf States, and southeastern North Carolina south through the remainder of the breeding range to southern Florida (AOU 1983).

During the late 1800s and early 1900s, Bachman's Sparrows made a rapid range extension to the north, with areas in Tennessee, Kentucky, West Virginia, southern Ohio and southwestern Pennsylvania colonized (Weston 1968). That range extension coincided with massive lumbering operations in the pine forests of the Southeast. Grasses flourished as the overstory was removed, leading to a large increase in the number of Bachman's Sparrows. Apparently, the resulting population pressure led to movement northward (Weston 1968). Habitats occupied in the newly acquired range were shrub thickets and dense weedy vegetation in clearings and old fields, and the species was recorded at elevations up to 3,000 feet in the spruce-fir zone of West Virginia (Weston 1968). In recent years the species' range has again contracted southward.

Bachman's Sparrow is an uncommon and local breeding species in the southeastern and south-central portions of North Carolina. It is rare or absent in the northern coastal plain and rare in the piedmont. Major populations are known to occur on the Fort Bragg Military Reservation, the Sandhills Game Lands, and the Camp Lejeune Marine Base, as well as in the Croatan National Forest and in Brunswick County. Formerly, the species bred throughout the state east of the mountains, and in some mountain valleys (Pearson et al. 1919). It is uncommon to rare as a wintering species from the Sandhills and the Croatan National Forest south.

Bachman's Sparrows are, at present, largely restricted to the moderate-to-dense stands of wiregrass (*Aristida stricta*) usually growing beneath longleaf pines (*Pinus palustris*) in North Carolina. These sparrows may also be found in cutover pine woods, provided the grass ground cover is undisturbed. Bachman's Sparrows occur in weedy and brushy fields adjoining wiregrass stands during summer. In winter they are largely restricted to dense stands of wiregrass, especially fruiting stands burned the previous spring or summer. The species formerly occurred in brushy fields and cutover woods in the piedmont and in some mountain valleys, but it now appears to be absent from those habitats and regions.

Bachman's Sparrow has been recorded from a variety of habitats, including old fields in the Midwest and South, open oak groves in Pennsylvania, limestone glades in the Ozarks, tung-oil groves and borders of agricultural fields in Florida and Georgia, and southern pine woods (Weston 1968, Allaire and Fisher 1975, Hardin et al. 1982, Hardin and Probasco 1983). These habitats generally resemble pine



BACHMAN'S SPARROW

● Nesting-season record

savannah in being characterized by a dense herbaceous layer below an open canopy. This similarity, and the fact that the species has not persisted in some of the more divergent habitats occupied during the range expansion, suggests that pine savannah is the primary habitat (Weston 1968). Indeed, the ancestral range, which increasingly corresponds to the current range, is concurrent with pine savannah.

Bachman's Sparrow, despite its temporary habitat expansion, appears sensitive to habitat disturbance, particularly alteration or destruction of the grassland ground cover. Litter accumulation caused by fire exclusion appears to deter Bachman's Sparrows. The bird is most common in stands burned every 1 to 3 years. Prolonged fire exclusion (5 years or more) leads to hardwood encroachment and the breakup of the grassland ground cover. Once stands of wiregrass have been destroyed, the sites cannot be readily restored to that species nor, therefore, to Bachman's Sparrow habitat. Forest management activities such as dense stocking and intense site preparation have similar effects.

North Carolina now houses the northernmost major population of Bachman's Sparrow, which is the only species of sparrow that breeds in undisturbed longleaf pine-wiregrass communities.

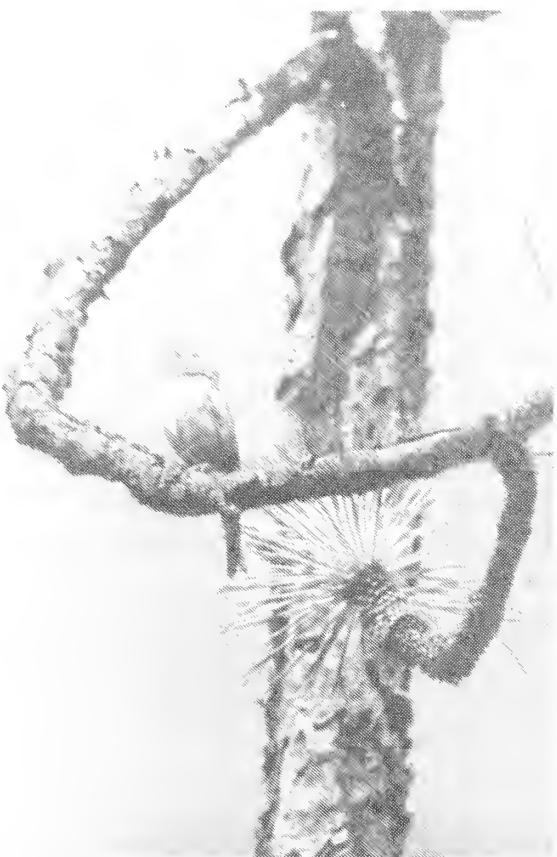
Life History and Ecology. Bachman's Sparrow is a highly specialized forager (Allaire and Fisher 1975). It forages only on the ground, searching for grass seeds in a thorough, deliberate manner. In the breeding season, invertebrates are also taken in this way. The species is a solitary forager at all seasons. It escapes by running when disturbed. Pines and

shrubs are used primarily as singing and lookout perches in the breeding season.

Little is known about the breeding biology of Bachman's Sparrows. They are territorial. One study recorded an average territory size of 0.62 ha (1.55 acres), but that was in an unusual habitat (glades in the Ozarks) where territories were not contiguous (Hardin et al. 1982). Placed on the ground, nests are usually concealed against a clump of grass or low shrub (Hardin and Probasco 1983) and are often roofed or domed. Clutch size is three to five, and two broods may be raised in a season (Weston 1968). Egg dates in North Carolina range from 2 May to 15 June (seven records: Weston 1968 and Carter, unpublished). Both parents tend the nestlings and fledglings (Weston 1968).

Rationale for Evaluation. Bachman's Sparrow has undergone a pronounced decline in numbers in the past few decades, to the extent that it has been placed on the Blue List of declining species (Hardin and Probasco 1983). It is not listed as Threatened or Endangered by the U.S. Fish and Wildlife Service, but is so designated by several states.

Some of the decline represents withdrawal from the previously described range expansion. More disturbing is the decline of the species within its ancestral range, including North Carolina. This clearly seems related to loss of habitat, specifically of the longleaf pine-wiregrass community, which has been greatly reduced by timbering, fire exclusion, and development. Undisturbed longleaf pine savannah was once abundant in the state, but it is now rare and localized. The bird's recent history is similar. Brimley found it singing quite commonly near Southern Pines in June 1909, and



Bachman's Sparrow

(S. A. Grimes)

Pearson found it to be the most common species in pine woods in Brunswick County in August of that same year (Pearson et al. 1919). Only in a few specific places can the species be found commonly now, and even in those places it is local. The species perhaps has been in decline since colonial times, when the virgin pine forests and their associated grasslands began to be destroyed. Suitable habitat has been rapidly depleted since the advent of fire exclusion in the 1920s and 1930s, and the subsequent development of industrial forest management and continuation of land conversion accentuated the loss. Most remaining Bachman's Sparrow populations are on public lands, but because of the extreme sensitivity of the wiregrass community to disturbance, that does not guarantee the birds' safety. Proper habitat management is needed to halt the decline of Bachman's Sparrow.

Recommendations. Research is needed to better document the distribution and abundance of this elusive species in North Carolina. Such surveys should concentrate on public lands in the Sandhills and southern coastal plain, the only areas where major populations likely occur. Active management, including prescribed burning in late winter or spring every 1 or 2 years and protection of the wiregrass ground cover, is recommended where major populations occur on public lands. It may also be necessary to thin pine stands and to take steps against hardwood encroachment.

Management of this species is compatible with management for other wildlife inhabiting the longleaf pine savannah, including the Red-cockaded Woodpecker, Northern Bobwhite, Wild Turkey, White-tailed Deer, and various rare plants. Timber may be harvested, provided the ground cover suffers minimal disturbance. Baling of pine straw may also be conducted, and may even benefit the sparrows as long as removal of pine straw does not supplant prescribed fires. If the ecosystem in which the Bachman's Sparrow lives is properly protected, the species will likely thrive.

Acknowledgments. Some of the information included in this account was acquired during our research with P. D. Doerr on Red-cockaded Woodpeckers in the Sandhills. The project was funded by the National Science Foundation (BSR-8307090, BSR-8717683).

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Prepared by J. H. CARTER III AND JEFFREY R. WALTERS



Peregrine Falcon (N.C. Wildlife Resources Commission)

VULNERABLE

The following species are, for the most part, uncommon in North Carolina; they have small populations that are restricted to only a few specific sites. All are believed to be of potential concern but, unlike the preceding species, none are believed likely to become extirpated statewide. All populations appear stable, and several are actually expanding. Colonial nesters are especially vulnerable to disturbance or destruction during the nesting process; therefore, protective management of nesting sites is warranted.

BROWN PELICAN

Pelecanus occidentalis

Brown Pelicans are year-around coastal residents. Inland occurrences are rare (e.g. Crutchfield 1982). Previously regarded as Endangered, East Coast populations of the Brown Pelican were removed from the federal list in 1986. In North Carolina the species was historically confined to a single nesting site. Recent studies have shown that the local nesting population is expanding both in numbers and in distribution (Parnell and Soots 1976; Parnell and Shields, in press). Nesting colonies occur at several sites between Oregon Inlet and the mouth of the Cape Fear River. Breeding birds, now numbering more than 2,000 pairs, are currently dependent on proper management of dredged-material islands near maintained waterways (Parnell and Shields, in press).

DOUBLE-CRESTED CORMORANT

Phalacrocorax auritus

This is an abundant winter visitor to coastal areas. Concern is for a small, stable (perhaps growing) nesting population in the state. Formerly breeding birds were confined to small colonies at Great Lake (Pearson 1905) and Lake Ellis in Craven County (Grant 1970). These birds were regarded as the northernmost breeding population of the southern subspecies *P. a. floridanus*. Subsequent study (NCSM, unpublished) has shown the North Carolina population to be intermediate in character between northern and Florida forms. The status of modest numbers of nonbreeding adult birds in the summer is not clear. Cormorants were reported nesting in the piedmont for the first time in 1985 (Chat 49:102) at Jordan Lake in Chatham County. The subspecies of the birds at Jordan Lake is unknown. Although only a few pairs of Double-crested Cormorants are actually known to breed in the state, the general increase in numbers and breeding distribution in the eastern United States in the last decade suggests that a continued gradual increase in the breeding population is likely.

GREAT EGRET

Casmerodius albus

This large egret nests in mixed-species colonies in estuaries and swamps. There were an estimated 500 to 800 nests in coastal colonies in 1988 (Parnell and Shields, in press). The only survey of swamp colonies was conducted in 1976 (Soots and Parnell 1979); 988 nests were found. The

Great Egret is vulnerable because of its colonial nesting habit and because of logging of swamp-forest nesting habitat.

BLACK-CROWNED NIGHT-HERON

Nycticorax nycticorax

These herons are fairly widespread throughout the coastal estuarine zone. They nest in several of the mixed-species coastal colonies, usually in small numbers. The nesting population along the immediate coast has produced between 175 and 200 nests since 1977, the first year for which there are data. There may be additional small colonies within the coastal swamps. Black-crowned Night-Herons are easily disturbed at their nesting sites, often being one of the first species to flush and one of the last to return after a disturbance. They are subject to the same problems as other wading birds.

WHITE IBIS

Eudocimus albus

This species is a permanent resident along the coast, especially from about Morehead City southward (Potter et al. 1980). The species was first reported nesting in North Carolina in 1950 (Stephens 1950). It now nests from near Southport in Brunswick County to Oregon Inlet in Dare County (Shields and Parnell 1983). In 1988, there were more than 6,000 nests in four colonies. However, more than 90% of all nests were at a single site in Brunswick County (Parnell and Shields, in press), which makes it vulnerable to problems at colony sites.

BLACK DUCK

Anas rubripes

This is a common winter resident found mostly along the coast, particularly in the northern counties. It is moderately common along the Outer Banks during the breeding season, but is rare inland. Problems are apparently caused by accumulation of pesticides and by genetic swamping through interbreeding with wild or semi-domestic Mallards (*Anas platyrhynchos*). Mallards are expanding their numbers in northeastern North Carolina, where large numbers of captive-reared birds are released each year.

RED-SHOULDERED HAWK

Buteo lineatus

A fairly common permanent resident throughout the coastal plain, the Red-shouldered Hawk becomes progressively less common westward across the piedmont. It is scarce in the mountains and absent from high elevations. As a migrant, it is relatively common statewide. Habitat loss, particularly of riparian woodlands, has extirpated or drastically decreased many local populations. To our knowledge, no detailed studies of this bird have been undertaken in North Carolina.

AMERICAN KESTREL

Falco sparverius

This species is a very common migrant and a common winter resident. Formerly a widespread nesting species, the American Kestrel has become quite rare in North Carolina, and in the southeastern United States in general. In the past decade, a small but increasing number of nesting-season records suggest that the kestrel is reoccupying its former range in the state. Most of the nesting-season reports are from urban areas. We assume that changing usage of persistent pesticides has accounted for the return of nesting birds, but that has not been proven. We are aware of no specific investigations of this raptor in North Carolina.

WILSON'S PLOVER

Charadrius wilsonia

Wilson's Plovers nest along the coast from the South Carolina border to the Outer Banks. They are most common in the southeastern portion of the state and relatively uncommon north of Morehead City (Potter et al. 1980). They generally nest on open sand flats just seaward of the dunes, on overwash fans, on bare sand flats behind the dunes, or on bare dredged-material islands. We know little about populations or breeding ecology in this state, but we do know that nesting habitat is being reduced by development and that increased human disturbance is very likely.

LEAST TERN

Sterna antillarum

Subspecies on the West Coast and in the interior of the United States have been declared Endangered, and there is concern for the population along the Atlantic Coast. In North Carolina, estimates indicate that the nesting population is relatively stable at 1,500 to 2,000 pairs (Parnell and Soots 1979; Parnell and McCrimmon 1984; Parnell and Shields, in press). Nesting occurs on beaches, on coastal islands, and occasionally on the mainland (Parnell and Soots 1979). Major problems are beach development, human disturbance of nesting colonies, and natural succession of plant communities on island nesting sites.

COMMON TERN

Sterna hirundo

When the first coastwide survey of North Carolina colonial waterbirds was conducted in 1977, Common Terns were one of the most abundant species nesting. Nearly 5,000 nests were censused that year in nearly 50 colonies. By 1983, the number of nests had been reduced to about 2,100 in about 30 colonies. In 1988, the number of nests had risen slightly to about 2,600, but the number of colonies was down to about 21. These medium-sized terns require bare to lightly vegetated nesting habitat, and the number of suitable nesting sites appears to be declining in the state.

ROYAL TERN

Sterna maxima

Royal Terns nest on island sites from the Cape Fear river in Brunswick County to Oregon Inlet in Dare County (Parnell and McCrimmon 1984). They characteristically nest on bare islands, generally those created by the deposition

of dredged material (Soots and Parnell 1975). The North Carolina nesting population is estimated to be between 12,000 and 17,000 nesting pairs, all of which nested on only eight sites in 1988 (Parnell and Shields, in press). Major concerns are reduced numbers of bare to nearly bare, isolated, elevated coastal islands and increased human disturbance at the small number of large nesting colonies.

FORSTER'S TERN

Sterna forsteri

This tern was first recorded nesting in North Carolina in 1972 (Fussell 1974). It nests on ephemeral patches of wrack deposited in marshes or along island beaches by tides (Soots and Parnell 1975). The North Carolina nesting population, occupying Pamlico, Core, and Back Sounds, is estimated at 900 to 1,100 pairs (Parnell and Shields, in press). Problems relate to natural losses for unknown reasons, to flooding, and to human disturbance of colony sites.

SANDWICH TERN

Sterna sandvicensis

This tern always nests in close association with Royal Terns in North Carolina. The nesting population is estimated at 1,200 to 1,800 pairs (Parnell and Shields, in press). Problems for Sandwich Terns are the same as those faced by Royal Terns.

COMMON BARN-OWL

Tyto alba

An uncommon, often very localized, permanent resident throughout the state, this species is seemingly decreasing in numbers. Lack of adequate nest sites near suitable foraging areas may be a limiting factor. Modest numbers of birds from the north apparently winter in the outer coastal plain. Except for a short note by Simpson and Ruiz (1973), no detailed published studies are available for this species in North Carolina. Lee and Allen-Grimes (NCSM, unpublished manuscript) have reviewed the current and historical nesting status and food habitats of this owl in North Carolina.

YELLOW-BELLIED SAPSUCKER

Sphyrapicus varius

Yellow-bellied Sapsuckers are common migrants and winter residents throughout North Carolina. The species' nesting distribution in the Southeast is confined to fragmented, localized populations above 3,500 feet in the Appalachian Mountains (Simpson 1972). A considerably larger number of breeding sites are known now than were known in 1977 (NCSM files). That probably reflects increased field work rather than an increase in the number of birds.

RED-BREASTED NUTHATCH

Sitta canadensis

An erratic migrant and winter resident throughout the state, the Red-breasted Nuthatch may be common in the piedmont and coastal plain in some years and rare or absent in others. The species is a permanent resident in the southern Blue Ridge Mountains in habitats above 3,840 feet. Simpson (1976) summarized ecological and geographical distribution of the breeding population. Nesting has been recorded on

two occasions outside the mountain section of the state (Rockingham Co., Chat 40:45; New Hanover Co., Chat 12:16). Concern for the nesting population results from problems currently affecting spruce-fir forests.

BROWN CREEPER

Certhia americana

This is a fairly common migrant and winter resident throughout the state. The breeding population is confined to the mountains, where Brown Creepers nest to elevations as high as 5,650 feet (Lee, personal observation). Concern relates to current deterioration of high-elevation woodlands. The endemic mountain population, *C. f. nigrescens*, is in need of taxonomic study, and no studies of this form have been undertaken.

CERULEAN WARBLER

Dendroica cerulea

This is an uncommon migrant in the mountains and a rare migrant elsewhere in North Carolina. The species nests in scattered mature hardwood forests with an open understory in the mountains and along the Roanoke River (Lynch 1973, 1984). It formerly nested at several additional sites in the western piedmont (Pearson et al. 1959). The species was listed as Threatened in 1977 primarily because of concern for the Roanoke River population, which has since been afforded protection. While there has been no statewide study of the Cerulean Warbler, ornithologists know considerably more about this species now than they did in 1973, primarily because of studies conducted by Lynch (1973, 1984).

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Prepared by DAVID S. LEE AND JAMES F. PARNEll

UNDETERMINED

There is insufficient information to make an adequate assessment of the conservation status in North Carolina for five species. Most are probably peripheral breeding species in this state.

YELLOW RAIL

Coturnicops noveboracensis

This species is regarded as a rare migrant and winter resident in the state. Its abundance is unknown (see Chapman 1969), and it is likely that its presence is often overlooked.

AMERICAN AVOCET

Recurvirostra americana

The only documented nesting record is from Pea Island (McVaugh 1978), but a few avocets may nest nearly every year at Bodie and Pea Islands, where birds are present all year.

NORTHERN GOSHAWK

Accipiter gentilis

Several breeding-season records are available for the southern Appalachians in North Carolina. These were summarized by Lee (1985).

LONG-EARED OWL

Asio otus

There are two nesting-season records for Grandfather Mountain (Lee et al. 1985, Lee 1985). These reports of calling birds represent the only evidence suggesting breeding by the species in the state. Long-eared Owls are known, however, to nest nearby on Mount Rogers in Virginia.

PINE SISKIN

Carduelis pinus

McNair (1988) found a Pine Siskin constructing a nest in a Fraser fir on Mount Mitchell on 2 June 1986. Although that nest was abandoned, it lends credence to the many reports suggesting breeding by Pine Siskins in the mountains of North Carolina, including one report of a preflight fledgling at Asheville (Tove 1987). Extralimital breeding may have occurred at Southern Pines in the spring of 1982 (Tove 1987).

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Prepared by DAVID S. LEE

Northern Goshawk

(D. R. Herr/VIREO)



RARE

Bird species placed in this category are not rare in the state because of a decline in population or because of a threat to their habitat; these species are simply present in low numbers. Most are considered peripheral species, in that North Carolina lies on the edge of their breeding range. Some of these birds nest commonly in adjacent states, whereas others tend to be rather rare throughout the Southeast. These species are not listed as Endangered, Threatened, or Vulnerable in North Carolina. However, because they are locally rare as breeding birds, their presence is of interest. Following is a listing of Rare species, with comments on their breeding status in North Carolina.

AMERICAN BITTERN

Botaurus lentiginosus

A secretive and poorly known breeding bird in freshwater marshes (and possibly brackish ones) in the northeastern part of the state, apparently south at least to Cedar Island in Carteret County. There is only one documented nest record (Rabb 1941, Potter et al. 1980).

YELLOW-CROWNED NIGHT-HERON

Nyctanassa violacea

A secretive bird that nests in swamps, the Yellow-crowned Night-Heron breeds sparingly throughout the coastal plain and very rarely in the piedmont (Potter et al. 1980). The inland birds tend to withdraw toward the coast in winter.

MISSISSIPPI KITE

Ictinia mississippiensis

This species probably breeds (though no nest has been found) in the Roanoke River flood plain near Scotland Neck (Lynch 1981) and possibly in other extensive coastal-plain bottomlands and swamps.

NORTHERN HARRIER

Circus cyaneus

Although there is only scant nesting evidence for the state, the Northern Harrier apparently breeds at Cedar Island and a few other places in the northern coastal areas of the state (Lee and Irvin 1988).

SHARP-SHINNED HAWK

Accipiter striatus

This is a common migrant, particularly along the coast in fall. It is a fairly common winter resident and a rare and local breeder. Current concern is for the breeding population. Meyer and Mueller (1982) summarized recent nesting evidence. Although they presented records from all regions of the state, nesting is probably limited to scattered sites in the mountains and piedmont.

BLACK RAIL

Laterallus jamaicensis

A very secretive species apparently present in many brackish marshes, the Black Rail is known mainly from

Carteret and Dare Counties. It is occasionally found in summer in the piedmont and mountains (Potter et al. 1980).

PURPLE GALLINULE

Porphyrio martinica

Breeds mainly in extreme southeastern North Carolina, but has sporadically nested in several other places in the southern coastal plain (Potter et al. 1980).

CASPIAN TERN

Sterna caspia

A few pairs breed on small coastal islands from Oregon Inlet to Ocracoke Inlet (Parnell and Soots 1979, Parnell and McCrimmon 1984).

COMMON GROUND-DOVE

Columbina passerina

A peripheral species that has declined since 1980, the Common Ground-Dove nests sporadically along the immediate coast north to Pender County and possibly in Carteret County (Potter et al. 1980).

BLACK-BILLED CUCKOO

Coccyzus erythrophthalmus

This species is a rather uncommon breeder in the mountain region, mainly in high-elevation deciduous forests. It has been known to nest on rare occasions eastward into the coastal plain (Potter et al. 1980).

ALDER FLYCATCHER

Empidonax alnorum

Disjunct populations nest in high-elevation shrub thickets and shrub bogs, mainly on Roan Mountain and near the Shining Rock Wilderness Area (Young 1984).

BANK SWALLOW

Riparia riparia

Bank Swallows have nested at Lake Summit in Henderson County (Pickens 1954) and in a bluff along the Roaring River in Wilkes County (Snavely and Culbertson 1978). Suspected breeding in Person and Carteret Counties has yet to be confirmed.

HERMIT THRUSH

Catharus guttatus

Since 1979 the Hermit Thrush has been present during the breeding season in spruce-fir forests on Roan Mountain (Potter and LeGrand 1980), Grandfather Mountain (Lee et al. 1985), and Mount Mitchell (McNair 1987). The species probably nests, but there is no conclusive evidence.

WARBLING VIREO

Vireo gilvus

An uncommon breeding bird in streamside groves along the New River in the northwestern corner of the state, the Warbling Vireo also nests at a few scattered sites south to Buncombe County (Potter et al. 1980).

BLUE-WINGED WARBLER

Vermivora pinus

Although the species is present in summer in the western portion of Cherokee and Graham Counties (LeGrand 1975), no positive evidence of breeding has yet been reported.

MAGNOLIA WARBLER

Dendroica magnolia

A few recent summer records from spruce-fir forests in the northern mountains suggest breeding south to Mount Mitchell (Lee 1985). No nest has yet been found, but adults were seen carrying food at Roan Mountain (Am. Birds 29:973, Herndon 1977). The site, near the Rhododendron Garden, is on the North Carolina side of the mountain.

LARK SPARROW

Chondestes grammacus

A small, highly disjunct breeding population was discovered in the Sandhills region of Richmond and Hoke Counties in 1981 (McNair 1982). Lark Sparrows were subsequently found on the Fort Bragg Military Reservation in Hoke County (Chat 49:27). McNair (1983) confirmed the identity of the Lark Sparrow egg set taken at Raleigh in 1889.

SAVANNAH SPARROW

Passerculus sandwichensis

This species has been reported during the breeding season (though no breeding evidence was found) in pastures and grassy fields in Alleghany County (LeGrand 1983) and Wilkes County (Smith 1967).

RED CROSSBILL

Loxia curvirostra

This very erratic nesting species seldom occurs in the same locality from one summer to the next. It is found mainly in spruce-fir forests, but all nests reported from the state have been in white (Haggerty 1982, McNair 1988) or Table Mountain (Simpson 1987) pines. Extralimital breeding has been reported from the piedmont and Sandhills (Potter et al. 1980).

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